# AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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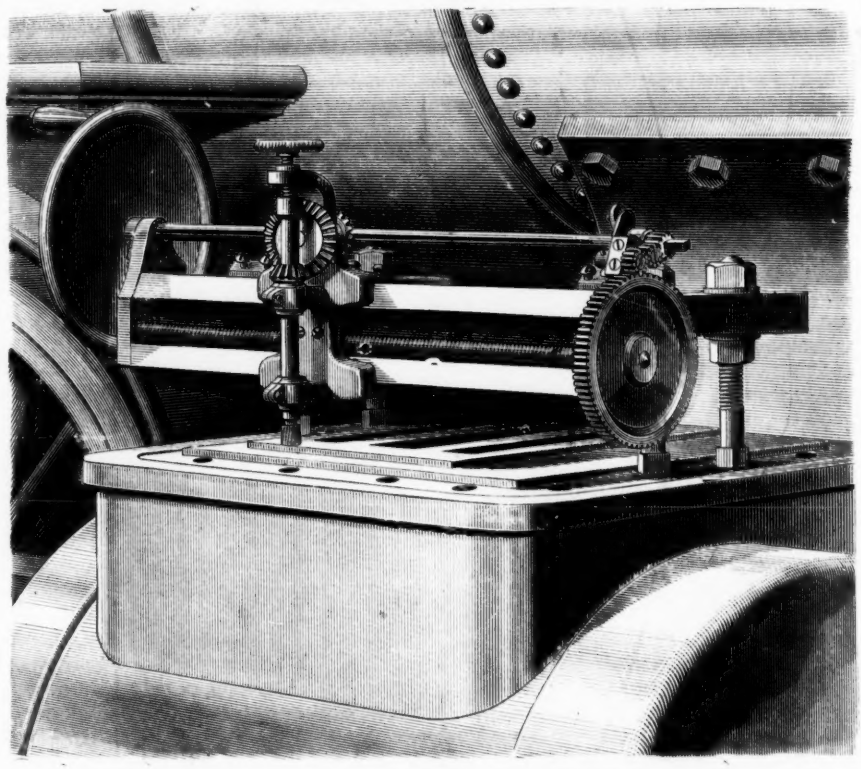
## Steam Chest Seat Milling Machine.

All persons who have had experience in locomotive repairs are aware that the inside of the steam chest about the valve seat, and particularly the joints, become corroded and eaten away by the action of the steam in conjunction with the acids contained in the tallow used for lubrication. In many cases the iron becomes so soft as to be easily cut with a knife. The surfaces forming the joint between the steam-chest and cylinder suffer particularly in this respect.

When these surfaces become so badly corroded as to cause a leak, a hammer and chisel are brought into requisition, and the surfaces chipped and filed until the low spots are removed.

This is a slow process, particularly when the surfaces are wasted so badly as to require the insertion of strips of brass or copper, which are driven into the recesses, and the top filed to a true surface. The machine herewith illustrated is adapted to the work of grooving for the strips, also of trueing off the top surfaces of the strips after they are inserted. This operation requires but a short time with the machine, and the work is done in a superior manner.

The machine referred to consists of a cross-head or slide, to which is attached a sliding head, which carries a spindle similar to a drill press. Motion is communicated to this spindle through beveled gears connected with a transverse shaft, as shown. The motion is rendered more steady by the application of a heavy rimmed fly wheel, which also serves as a crank. The cutting is performed by a face milling cutter, which is inserted in the end of the spindle, and is fed up and down by means of a screw and wheel. The sliding head is fed in either direction by means of feed gears at the end of the feeding screw. The machine is held in position by four studs, used in the place of the usual steam-chest studs, as shown. After the machine has been set, the cutter may be set to the required depth and the feed adjusted, then by turning the wheel the work will be accomplished. The feed may be thrown in or out of gear when required. This machine is likewise adapted for cutting out the ports in new cylinders, and does this work neatly and cheaply, being far superior to the old and usual method of chipping out by hand. By using a drill in the place of a cutter, this machine may be used as a drill press for studs, or in putting on false valve seats. It is being used in several railroad shops with success, and is made by A. H. Campbell, Box 657, Hartford, Conn.



STEAM CHEST SEAT MILLING MACHINE.




FIG. 1.




FIG. 3.




FIG. 2.

## Improvement in Piston-Rod Packings.

We illustrate herewith what is known as "Wilkinson's Paragon Metallic Piston-Rod Packing."

The object has been to construct a packing entirely of metal, permitting any necessary vibration of the rod, free from the action of steam pressure, working with little or no friction, requiring little or no lubrication, securing an absolute steam-tight joint, and which shall be applicable to the stuffing boxes of steam engines now in use. The committee on "Science and the Arts," constituted by the Franklin Institute, to whom this packing was referred for examination, reported that the invention is to be classed among the metallic packings for piston rods, valve stems, and plunger pumps. That committee describe it as composed of independent and separate sectional socket cases fitted to each other, in two or more sequences, by steam tight recesses. The socket cases, when so joined, form compartments, each one containing five or more elliptical springs, having their ends resting against the inner sides of the wall of the cases, and impinging upon a brass ring, cut in one place, and bearing inward towards the center of the cases. These brass rings encircle annular rings of anti-friction metal cut in two or more sections, and being pressed upon by the brass rings and elliptical springs, perfectly surround the piston rod, steam tight with light pressure, and capable of yielding to any deflection it may make from the true line of its motion; while at the same time preventing the escape of steam around the rod or into the compartments, as the rings have, practically, steam tight side joints.

The brass and anti-friction metal rings are permitted to rotate together with any torsion the rod may have.

The rod has no contact with the flanges of the socket cases forming the compartments, and in these interstices there is ample room for condensed steam and oil to rest in as a lubricant. In their report the committee say: "The whole forms a good, substantial, elastic, steam-tight packing, yielding to any deflection or torsion of the rod, without permitting the escape of steam at any point."

As will be seen by reference to the engravings, this packing is made in two forms; Fig. 1 being designed for application inside the stuffing box, a metal or rubber joint being formed between the cases and bottom of stuffing box, thus securing the packing by the gland adapted thereto, without any alteration whatever. This is reported to have proved an excellent device in cases where the rod has no guide, as in valve stems connected by rocker arm and plunger pumps.

Fig. 2 is designed for application partly outside the stuffing box, the joint being formed on the face of the same between the stud bolts. Being made of brass nicely finished, it combines ornamentation with efficiency.

Fig. 3 is a vertical tranverse section through line *x x* of Fig. 1, showing arrangement of springs and general construction.

This packing is made by Alfred Wilkinson, Manayunk, Philadelphia, Pa.

English cutlery and other manufacturers show some alarm in view of the proposed French tariff. With the tariff newly established in Germany, and an agitation begun in England favoring a retaliatory tariff there, the English freetraders' dream of the time when England will do the manufacturing for the whole world does not seem likely to be realized.

## Holding Power of Tubes in Steam Boilers.

In our last issue we presented the results of some experiments made for Mr. J. M. Allen, president of the Hartford Boiler Insurance Co., to determine the holding power of tubes when rolled into the tube sheet with the Dudgeon Expander. These experiments, which are of unusual interest to boiler makers and steam users, were extended, and by the courtesy of Mr. Allen, we are permitted this week to present the other engravings referring to them, and the final deductions from the experiments. Mr. Allen treats the subject as follows:

"So much depends upon the proper use of the Dudgeon Expander that some mechanical engineers are quite reluctant to accept the theory that all tubes thus rolled in, are equally effective in sustaining the head, or tube sheet. This criticism is in a measure true, and hence all boiler makers who have pride in their work and regard for their reputation should know that this work is well done. The riveting over of the ends of the tubes is quite generally practiced, and when well done makes a very strong joint, but those who are familiar with this kind of work know that in many cases the ends of the tubes are frayed out and split, and until the 'thumb tool' is brought to bear, the job has a very unpromising look. Such work yields readily to the action of the heated gases, and after a time the riveting, or beading, fractures and crumbles off, and very little strength remains. This fraying and cracking is sometimes attributed to a want of proper annealing of the ends of the tubes, but it is quite as often the result of unskilled workmanship. We have seen it so often that we are never sure that it is well done."

"Another method of fastening tubes into the tube sheet, and one that, so far as we have investigated, works well; the test being upon boilers in use, is to adjust the tubes so that they shall project slightly beyond the tube sheet. Roll them in with the Dudgeon Expander, and then with one of the tools shown in Figs. 1 and 2, flare, or further expand the projecting ends. Figs. 3 and 4 show the above tools in cross section."

"Little explanation of the manner of using them is necessary. After the tubes are rolled in, either of the above tools can be used for expanding the ends. Some prefer the tool with two points of contact, and others use the one with three. The tool is inserted into the end of the tube and driven with a hammer until the end of the tube is brought solid against the tube sheet. Only light blows are required, and the workman can readily tell when the expanding is sufficiently done. Fig. 5 shows a tube which has been expanded by this method."

"In order to ascertain what the holding power of tubes set in this manner would be, we arranged with H. B. Beach & Sons, boiler makers in this city, to prepare for us two (2) specimens for test. They were tubes three inches external diameter rolled into $\frac{3}{8}$-inch plate, and expanded as described above. These specimens were handed to Mr. Charles B. Richards, Consulting Engineer at Colt's Armory, in this city, with the request that he submit them to the required test. The following is Mr. Richards' report:

*Report by the Colt's Patent Fire Arms Manufacturing Company of tests of the holding strength of two boiler tubes expanded into iron plates. The samples were received October 8th, from Mr. J. M. Allen, and were tested for him.*

The external diameter of the body of the tube was 3 inches, and the thickness 0.109 of an inch. One end of the tube was fastened in an iron plate $\frac{3}{8}$ of an inch thick and 6 inches square. The tube was fastened in the plate by being expanded, and the end of the tube, which projected $\frac{5}{16}$ of an inch beyond the plate, was flared so that the external diameter of the extreme end was 3.2 inches, while the diameter of the tube where it entered the plate was expanded to 3.1 inches in diameter.

The test was made by observing the stress required to draw the tube out of the plate, but the tube was not wholly removed from the plate in specimen No. 1,079.

Both samples were originally alike, so that the description of one of them, answers for both.

The stress which was sustained without the tube yielding in the plate was

For specimen 1,078, 20,000 lbs.
For specimen 1,079, 18,500 "

The observed stress which first produced yielding was

For 1,078, 20,500 lbs.
For 1,079, 19,000 "

And the observed stress which occasioned failure was

For 1,078, 21,000 lbs.
For 1,079, 19,500 "

The force was applied parallel to the axis of the tube, and the plate surfaces were held in planes at a right angle to the tube axis.

C. B. RICHARDS,
Engineer.

Office of Colt's Patent Fire Arms Manufacturing Co., Hartford, October 9, 1880.

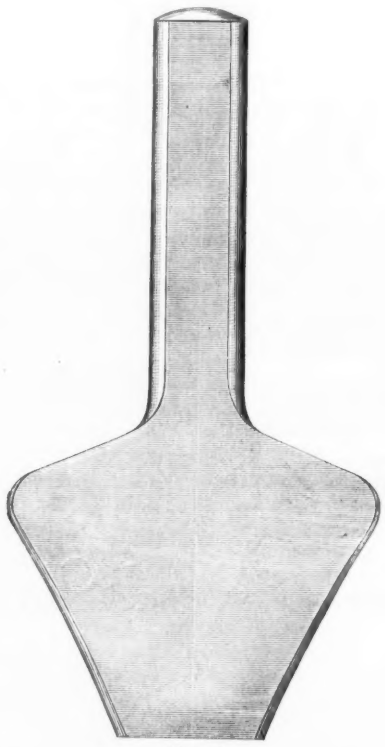


FIG. 1.

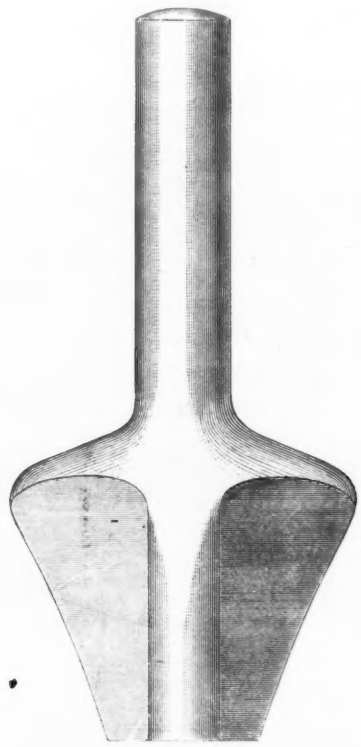


FIG. 2.

FIG. 3.

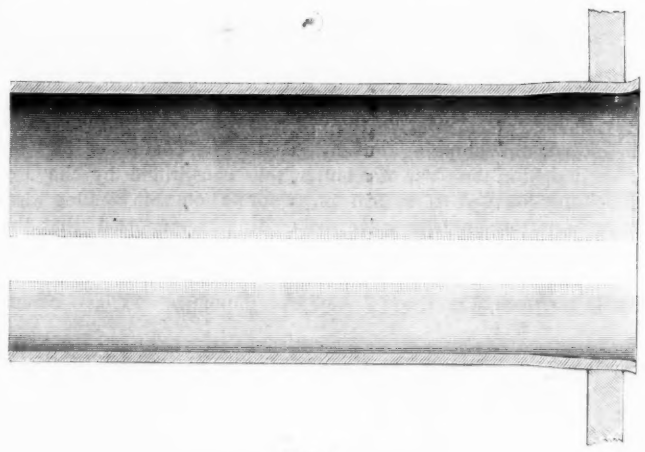


FIG. 5.

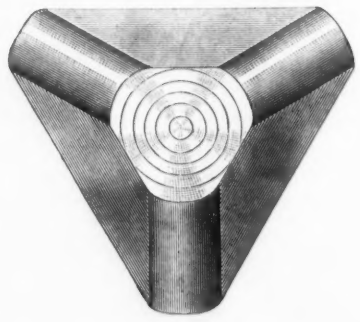


FIG 4.

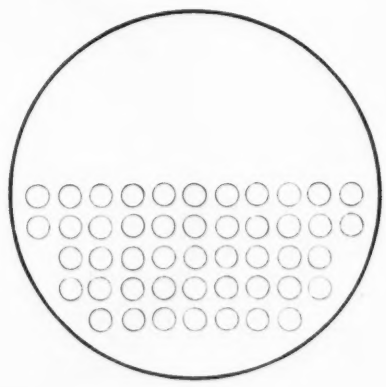


FIG. 6.

"From the foregoing, it will be seen that the observed stress which first produced yielding was 20,500 lbs. and 19,000 lbs. As in the problem in our last issue, so now. To ascertain what the holding power of the tubes in an ordinary tubular boiler 48″ in diameter would be, we have to multiply the holding power of one tube by the number of tubes.

"Fig. 6 represents the tube head of a 48″ boiler."

"We will assume the lowest result of the experiments, viz., 19,000 lbs., as the holding power of one tube. In the above tube head there are 47 tubes, and $47 \times 19{,}000 = 893{,}000$ lbs., the holding power of all the tubes. It will be seen that these tubes are in the lower half of the boiler. The upper half is supposed to be thoroughly braced and stayed by stay rods running back on the body sheets of the boiler. Consequently the tubes furnish the support for the lower half of the tube head. (We are not now taking into account the support derived from the joining of the flange of the head to the body of the boiler.) To ascertain the actual resistance of internal steam pressure to be overcome and provided for, we first ascertain the area of the head in inches, and multiply it by the internal pressure per square inch. The area in square inches of a tube head 48 inches in diameter is 1,809.6 square inches. But we have already stated that the upper half is supported by braces and stays running back on to the body sheets of the boilers, therefore only half the head is dependent upon the tubes for support, $1{,}809.6 \div 2 = 904.8$ square inches. Again we find that the lower half of the head is largely taken up by the tubes, consequently the area upon which the internal pressure can act must be further reduced by the area of the tubes. The area of a 3-inch tube is 7.069 square inches, which multiplied by $47 = 332.243$ square inches, $904.8 - 332.243 = 572.557$ square inches, the area of lower half of head upon which the internal pressure would act. We will assume the internal pressure to be 80 lbs. to the square inch, then $572.557 \times 80 = 45{,}804.56$ lbs., to sustain which we have the holding power of the tubes, 893,000 lbs., or nearly twenty (20) times the internal pressure on the lower half of the tube head. This, it must be understood, does not take into account the fact that the tube head is firmly secured to the body sheets of the boiler by its flange besides. As we have already said, boilers with tubes set in this way have been under our care for some years, and we have seen nothing to lead us to apprehend any trouble. The ends have given little or no trouble by being subjected to the heated gases. We would not recommend a projection of the tube beyond the tube sheet of more than one-eighth of an inch before expanding."

## Extracts From Chordal's Letters.

ALTERING THE FORM OF A MECHANICAL PRODUCT TO SUIT CUSTOMERS—SOME OPINIONS AND EXPERIENCES—HOW THE PUBLIC SCHOOL PRINCIPALS LIKED THE INK—COSTLY ARCHITECTURAL BLUNDERS—WHAT IS THE UNIT OF WATER POWER?

*Mr. Editor:*

* * * * In one of my very earliest letters to you, I referred to the question of altering the form of a product to please the present customer. I gave the views of the leaders of two classes, Mr. Sackett and Mr. Wyckoff. Mr. Wyckoff said he would do anything a customer wanted him to, and that he did not care whether the want was right or wrong. Mr. Sackett said he would make no changes, except such as would add permanently to the value of things. He would lose a sale before he would gratify the unwise whim of a customer.

* * * * Later experiences of my own have caused me to often think of my interviews with Wyckoff and Sackett. I have talked with and gathered the opinions of others on this subject, and I feel that I am doing a service in presenting to you the various views of various men.

* * * * Mr. G—— was many years ago a leading manufacturer; I need not say of what. He is now on the dwindle. In a conversation with me lately, he expressed himself about as follows: "When I was in good business I seldom looked around for causes. I exerted myself; the people bought my product; it satisfied them, and I made money. Young competitors sprang up around me, and my business began to fall off. Then I began to look into the science of the thing. I compared the products with a just judgment, and saw no merit in the competing articles superior to my own. Still, the articles were driving me from the market. I compared business processes, and found that my own exertions, under the decline, were far more energetic than those of my competitors, whose trade seemed almost to seek them. I then did what few men of my age and experience would do. I sought the advice of younger men. I got it in the opinion that my competitors made what the people wanted. I decided to do likewise. I investigated the form of competing products, and found that with unchanged functions they had been given meretricious shapes of novelty. I further found that the shapes, etc., were originated without an express demand from the market, and that the market welcomed the pleasing changes. All I had to do was to anticipate the wants of the people, and design my product accordingly. That was all. I soon found, however, that I could not take the first step in that direction. It required a genius of prophecy and perception, far less attainable to my mind than the spirit of useful invention. I might add to the position, utility or capacity, or convenience of a thing; but to deliberately entertain the idea of an Eastlake wheelbarrow, or a hand-painted crowbar, was beyond my ability. I cleaned out my old corps of talent, and substituted men of the new school

—prophets, artists, inventors, gods of taste and genius.

"They produced forms of seductive grace and wondrous suitability. I found that qualities which I had considered meretricious were qualities of real merit.

"What I had called a fancy, trifling, weak thing, proved under my own tests to be the clumsy thing of old, properly proportioned and better suited for its strains. The wheelbarrow was half as heavy and cost half as much as the old one, but it ran twice as easily, held twice as much, was twice as strong, and a thousand times as handsome. The crowbar had what looked like artistic swells and tapers, but which I found to be simply a scientific leaving off of metal when not needed. The things had really been too pretty to look useful to an old man like me.

"I now had my samples of things which my young advisers told me would sell, but I could not make them. My outfit, though very extensive and complete, was old style, and unsuited to the modern work. My chief men in the shops were of my own unmodern stamp, and not adaptable to the new way, and, above all, there was within me the feeling of inability to properly direct a business so much at variance with the past business of my life.

"Evidently my proper course was to abdicate in favor of a salaried manager of the modern type, and give him power to alter the plant and get new men. I am getting old now. I am rich. Life has few rough corners for me, and but few ambitions. Commercial ambition was the only prompter of what I have done in the matter so far, and when I see that before these promptings all the old men, who have been my lieutenants for years and years, must enter a new apprenticeship, and find themselves ignorant children or sour old men, as the case may be, I think seriously of quitting altogether, and throwing the onus of the change upon some one else. Either this or let the thing run back in its old channel. This will lead to a downward course, while if I quit, and quit soon enough, I can say I was one of the most useful and successful in my line."

* * * * So much for old Mr. G—— who never sees his customers. He sells to the trade. Mr. W—— builds something larger, and sees most of his customers. Here is what he says: "I always change when ordered and paid for it, except where I see that the change would do damage to my standing as a manufacturer. I didn't use to do it at all; and now I do it all the time with everything. It is having a bad effect on me and my business. The form of my product becomes uncertain and unrecognizable. If I send out a certain thing in good form and am praised for it, I immediately offset the matter by showing a defective shape in the next shipment. I find that my 'standing of product' account is generally on a balance with an ever-present tendency to run behind. I consider this such an important asset that the matter worries me. I think it better to sacrifice present profit to permanent future reputation for merit, than to sacrifice the immense future for the present profit. Still, I don't do what I think best. The effect of the erratic-production system on my own personality is bothering me also. Some years ago I had my business in my own hand. I was a king among my patrons. On my judgment and knowledge of what the majority needed my patrons depended; and in this position I had my own pride and reliance. As it is now, I yield to every wind that brings a sale. Instead of a king, I am the creature of my customer who uses, not my judgment, but my ability to execute his will. I have begun to look upon myself as a mere moneyed workman. I no longer read up on things; I no longer contrive; I no longer look into requirements; I idly wait for instructions."

* * * * Mr. Morgan is still another kind. He builds big machines originated on his premises. Said he: "There never was a step taken in my line which I did not inaugurate myself. For years the trivial whims of customers had no effect on me; but finally, not from principle or policy, but from pure laziness, I began to doctor my machines at the suggestion of every buyer. I have never looked into the philosophy or policy or result of the thing, but I know it to be an infernal nuisance. Of two customers for a machine for exactly the same purpose, one will want something made larger so it will be better, and the other man will want the same part made smaller so it will be better. That's the way the thing goes. Of course I know better than any one customer, or any half-dozen of them, what is correct. It is my business to know. I sometimes, on my own account, sacrifice a thing which I know to be superior, for a thing which I know will give most universal satisfaction to the crotchets of buyers. The changes sometimes ordered in my machines are annoying and exasperating. That is what a man gets for being in the machine business anyhow. If I was to choose a new business I would make molasses or something which customers would not ask to have changed in form every day."

* * * * Mr Morgan is one of those men who thinks that specific annoyances pertain to their own business only. He thinks that a nail factory makes nails and sells them without a quibble; that a certain grade of molasses would satisfy all buyers of that grade; in short, that lump sugar is lump sugar.

* * * * I find on my desk an advertising circular from a certain manufacturer of ink in New York. The circular will do Mr. Morgan a service, and will also illustrate a valuable and rare feature in advertising. The circular says:

"To 175 Public School Principals of New York we sent circular inquiries regarding our ink, as follows:

Do you use it? Do you like it?

We summarize the answers as follows:

22 Use it; like it exceedingly.
92 Use it; like it.
18 Use it, and use no other.
12 Will order it.
3 Use it, but think it a little too thick.
1 Uses it, but thinks it a little too thin.
2 Use it; best ever used.
4 Don't like it.
2 Say it is too black.
6 Say it is too pale.
3 Went back to David's.
1 Likes David's color.
3 Not satisfied; will try it again."

* * * * This ink business will illustrate molasses, nails, steam engines, boilers, steamships, machine tools, locomotives, wood-working machines, saw-bucks, boots, shoes, etc., etc.

* * * * In speaking, in a former letter, of shop architecture, I referred to practical architecture generally, and pointed to the New York Post Office as an example of "function omitted."

In the AMERICAN MACHINIST, two or three weeks ago, I noticed Postmaster-General James' opinion of this same building. He said, "It was put up with very slight inquiry into the necessities of the case, and is largely given up to architectural corridors."

* * * * The greatest architectural absurdity ever erected by man is the new State House at Albany. Probably a million dollars would not pay for the numerous architectural steam fireplaces put into this steam-heated modern building. The building is a costly pile of architectural example from end to end. The observant "Gath" aptly says: "It is an outrageous attempt to divert the reasonable tastes of a practical people."

* * * * I have fifty questions to ask, or rather one question to which I would like fifty answers, and I think, Mr. Editor, that the replies would be of use and interest generally. The question relates to power. We all know what a unit of power is, and what the unit amounts to; but every down-hill locality, with a running stream, has established arbitrary units of water power, some well defined, some not. We have in such localities the unit names of "powers," "runs," "stones," "runs of power," "mill-stone runs," "stone powers," etc., etc. In some States these units are legalized and defined by legislative act. In some it is the mere unit of a grantor.

I would ask, for general answer: What unit does your locality use for water power? How much power in the unit? And is it legalized?

* * * Very respectfully,

CHORDAL.

NEW SELF-FEEDING RATCHET DRILL.

## New Hand Ratchet Drill.

We present herewith engravings of a new ratchet drill stock, with a self-feeding attachment. The drill is represented in Fig. 1, ready for use. The drill stock or socket for holding the drill has two ratchet wheels upon it; one is right handed and the other left. Motion is communicated from the loose handle to these wheels through catches upon either side, which may be thrown into gear for working either right or left handed. By throwing both catches into contact with the wheels the stock is held rigid with the handle.

The special feature of this drill stock is the self-feeding device, which consists of an eccentric attached to the drill stock just above the handle. The throw of the eccentric may be increased or diminished by loosening the screw here shown, then rolling the marked collar to the right or left. A cross section of Fig. 1, at *x x*, is shown in Fig. 2, and illustrates the manner in which the feed is operated; *C* is a cross section of the feed screw; *D* is a ratchet wheel, which allows a free-sliding movement of the screw, but is prevented from turning upon the screw by a feather, as shown. The pawls *O P* are attached to the plate *E*, which is caused to oscillate by the action of the eccentric across the face of the wheel *D*, thereby causing it to revolve.

The feed is governed by regulating the throw of the eccentric, as previously described, the eccentric collar being prevented from turning by the feed rod, which passes through a hole at the back, and is allowed to swing around in the direction in which the drill turns until it strikes the brace or support for the ratchet, and is thus prevented from turning. An attachment is provided for throwing the feed out or in at pleasure, and when desired the ratchet may be used independent of the feeding device.

The inventors claim that the feed, being steady, saves the bits from breakage through over forcing at times.

The feed, being graduated, makes it well adapted to twist drills, even to small sizes.

It can be used as self feed or hand feed, the change being made instantly.

It is made by J. N. & R. N. Cherry, 327 Fourth Street, Jersey City, N. J.

## Castings of Iron and Bessemer Steel.

One of our readers in Arizona Territory who has been in the foundry business 25 years, and who owns a shop, writes that he has melted pig iron and Bessemer steel together in a cupola furnace for the last three years with the most satisfactory results, although the mixture cuts out a cupola twice as fast as the melting of pig iron alone. The castings, he says, are almost as tough as wrought iron, and can be chipped or planed as easily as wrought iron. A great deal of care, however, is required in making the charges in the furnace as well as practical experience in handling the metal in its melted state.

## An Immense Steamship.

The "City of Rome," of the Inman Steamship Line, which has just been launched, is, after the Great Eastern, the largest steamship in the world. Her length, over all, is 610 feet, length between perpendiculars 586 feet, extreme breadth 52 feet 3 inches, depth of hold 37 feet, tonnage 8,826 tons, and indicated horse power 10,000. The vessel is to be rigged with four masts. There are a large number of water-tight bulkheads, each extending to the main deck, the largest of them being only 60 feet long. If one of these were filled with water, the trim of the vessel would not be materially affected. The vessel has a single screw propeller, 24 feet diameter, driven by three sets of inverted "tandem" engines working on three cranks, disposed at an angle of 120 degrees with one another. The screw shafting was made in sections. Each length was made from a hollow cylindrical ingot of steel, which, while in the molten state, was subjected to a heavy hydraulic pressure. The ingot was afterwards reheated and placed on a mandrel; then forged, and drawn by hydraulic pressure until it finally assumed the form of a double collared shaft. The vessel is intended to make 18 knots an hour, and will run between New York and Liverpool.

*Engineering* discusses the proposed changes in the British patent laws, and recommends a reduction of the fees and making them payable by annual installments. "By this plan," says the journal quoted, "he who intends to keep up and work his patent can, if he so please, pay up in advance, even as some few do now, notwithstanding the heavy duty. On the other hand, the patentee who has in his own mind practically abandoned the idea of working out his patent, will soon tire of paying the annual fee, as is shown by statistics of French and Belgian patents, and the ground will be the sooner cleared for those who may wish to follow in the same direction, but a step or two in advance."

The next annual meeting of the Railway Master Mechanics' Association is to be held in Philadelphia June 2, 1882, and that of the Master Car Builders' Association at Niagara Falls the third Tuesday in June, unless a conference of committees from both Societies agrees to hold both conventions together.

The length of railroads built in the United States in the year ending April 1st, 1881, was 6,113 miles, or twice the mileage of the preceding twelve months.

The Société des Acieries de Longwy in France is erecting immense new engineering shops, steel works, and foundries. The plant will suffice for the production of 100,000 tons of steel per annum, and the foundries and shops are to be fitted up to turn out from 80 to 100 tons per day in pieces of every dimension.

## Mechanical Drawing.

BY PROF. JOHN E. SWEET.

TOOLS REQUIRED.

The cuts which will accompany these articles in the AMERICAN MACHINIST are not given as specimens of drawings for the student to copy, but as progressive lessons, to illustrate a few of the many problems that can be solved by drawings, or the "graphic method," as it is called; to show the ordinary method of representing common things, in machinery; to point out what the author believes to be the latest and best methods of constructing the most frequently used details; and possibly to give a few examples of the most recent designs of standard machine tools and engines.

The first question presenting itself to the student about to commence the practice of mechanical drawing is that of tools; which usually is looked upon as a matter of much more importance than it really is.

A young man at all skilled in the use of wood-working tools can make for himself all he requires to begin with. And commencing with the fewest tools possible, he acquires habits that make him a more rapid workman than if he starts with an elaborate set of draughting instruments, half of which are often worse than useless.

A plain pine board, well seasoned, of any size from 18 inches to 2 ft. in width, and from 2 ft. to 3 ft. long, serves every purpose. From 1⅛ in. to 1¼ in. in thickness is better than a thinner one. Such a board can be improved only by sawing it through from end to end in strips about two inches wide, turning each alternate one over and glueing the whole together again to prevent warping. The pieces should be numbered and kept in their numerical order, and turned endwise rather than sidewise, because if the board is originally at all cross-grained, it can then be planed just as well, which cannot be done if the strips are simply turned bottom-side up.

Such a board, with a smooth, flat surface, with the edges and ends square, and with the corners rounded about one-half inch, as shown in Fig. 1, cannot be improved by any kind of cleats or framing. It is customary to use only the left hand end of the board to work from, but if the side toward the workman and the left hand end of the board be made straight and square with each other, one-half of the work can be done just as well and much more rapidly. Many will question the possibility of making or keeping the board square, but the same skill that makes the T square, the set square and triangles true, will make the drawing board true. With a square drawing board, all horizontal and vertical lines drawn from the end and front of the board will be at perfect right angles, and this whether the T square be square or not.

Fig. 2 shows the most simple, and by far the best form of wood T square that can be made. Straight grained, well seasoned hard wood of any kind will do. Maple or beech, which can usually be procured of straight grain, is better than the imported woods, which are seldom straight, and never remain straight unless sandwiched together with more or less complication. A blade 30 or 40 inches long may be ¼ in. thick where secured to the head, and $\frac{1}{16}$ in. thick at the other end, chamfered down so as to be of uniform thickness along the edge used, which is the edge from the workman when the square is held in the left hand. Two-sevenths of the length of the blade is a fair length for the head or stock, which should be about ⅝ of an inch thick, free from all mouldings except half round edges across the ends and back to the blade. The blade should never be bedded into the head, nor secured permanently in any way. First, if bedded in the head, it interferes with the use of the triangles. Second, if secured permanently, it is more difficult to true up. Simply screwed on, as shown in the figure, by four screws, answers every purpose. That the edge of the head which glides along the edge of the board, and the edge of the blade used to guide the pencil be straight, is of the utmost importance. That they are at right angles to each other, or square, is of scarcely no importance, only it is desirable to have a square practically perfect, for it may be found useful for other purposes when least expected. The T squares of French and German make, usually those kept by the dealers, with swivel heads, are worthless. The next tool, unless we call a lead pencil and a piece of india rubber tools, is a rule or scale. A common rule will do to measure with, but is not as convenient as a scale, which the workman can make for himself if he can procure a Darling, Brown and Sharpe steel scale, or any other accurately spaced rule to copy the graduations from. A triangular scale, such as are generally sold to draughtsmen, is a good form, but unless all six edges are graduated alike, they prove to be the best specimens of left-handed economy ever devised. If as usually made, with the six edges having six different degrees of graduation, the workman generally turns it into from one to six positions every time he takes it up to take a measurement.

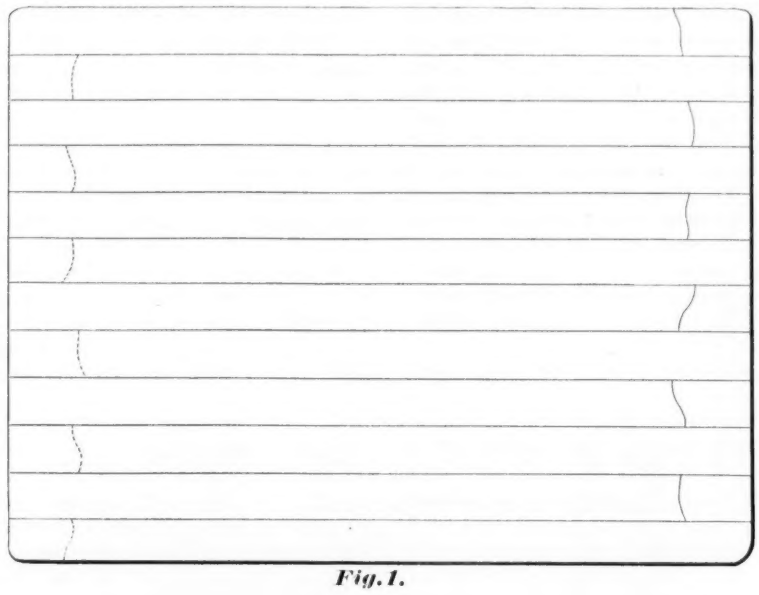


*Fig. 1.*

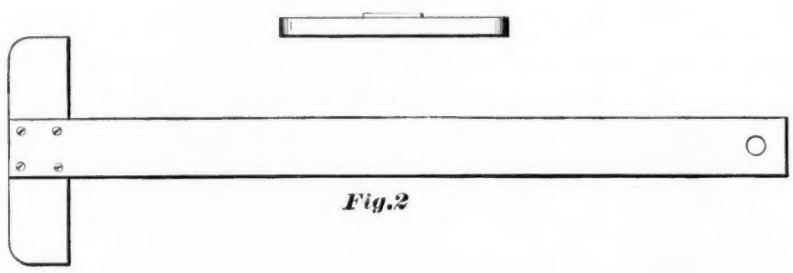


*Fig. 2*

As nine-tenths of all the draughting to be done by those who are likely to follow these suggestions will be of work done, or to be done in the machine shop, he should use exactly the same kind of measuring tool the machinist uses—that is, the foot-rule divided into inches, the inches sub-divided into halves, quarters, eighths, sixteenths, &c. Rolled iron, drills, taps, reamers and all standard tools are made to these dimensions, and if the draughtsman confines himself to the use of the same standard, he is not likely to be making drawings to such an inconvenient scale as two inches to the foot, which no machinist can measure, nor to designing bolts $\frac{7}{16}$ of an inch large, that no manufacturer is prepared to supply.

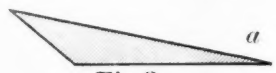
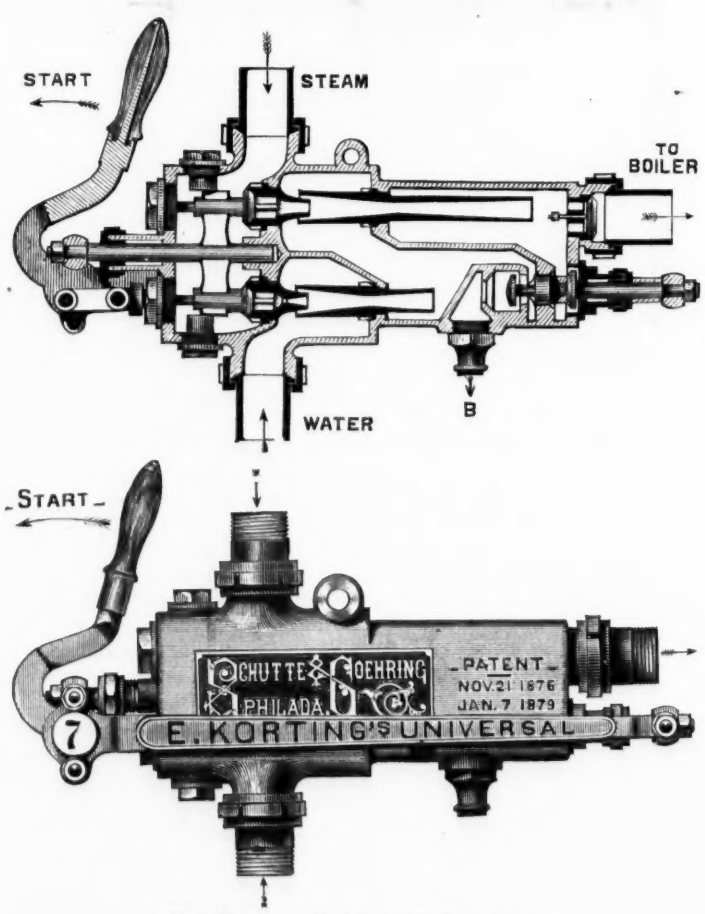



*Fig. 3.*

A piece of any kind of white hard wood, maple or holly, 12¼ in. long, and dressed in the form shown in full size section, Fig. 3, graduated along the edge at *a*, will answer. By bedding the steel scale properly graduated, and the wood blank, side by side into a board, so their upper surfaces will come level or "flush," and securing them against slipping the wood scale can, by the use of a try square and a sharp knife, be graduated as accurately as the steel scale itself. The ends of the scale should be left projecting ⅛ in. past the zero, and 12 inch marks as measurements can be taken more accurately from a mark than from the end of the scale. If a Darling, Brown & Sharpe triangular scale be preferred, order one in which all sides are graduated alike, 8th, 16th, &c.

With these tools alone, all of which can be made by the apprentice or student, or by any good wood workman, the beginner can commence work.

The main point is to get something in the shape of a flat board, something to serve as a T square and a rule to measure with, pencil, paper and a piece of rubber. The apprentice who thinks he wants to learn to draw will keep on thinking so, but the one who *wants* to learn to draw will have these few tools before the week goes by.




THE KORTING LOCOMOTIVE INJECTOR.

## Korting's Universal Locomotive Injector.

The chief object to be considered in making an injector, is in so arranging the parts that they may be operated with the least possible manipulation. Especially is this desirable upon a locomotive injector, where the engineer cannot afford to have his attention diverted for the purpose of manipulating the valves and levers of the injector.

Many a serious railroad accident has been caused by the engineer having his mind drawn from his most important duty, viz., the safety of his train, to a badly working injector.

It is necessary that the boiler be supplied with water, and when the engineer finds that his pump or injector will not work, he, as a rule, neglects everything else until he has succeeded in starting the feed to the boiler.

The two engravings accompanying this description represent the new Korting Universal Locomotive Injector complete, and in section. This injector is so arranged that the two steam valves and overflow valve are all connected with and operated by one lever. The general construction of this injector is too well known to need another description at this time. The peculiar features of the one here shown, in addition to those described, are that it requires but one stud to attach the injector to the boiler. The handle for working the injector, being placed at the center, may be easily and quickly operated by the engineer, who will readily appreciate this improvement.

The internal arrangement of this injector admits of a wide variation in the steam pressure, without interfering with its effective operation.

To start the injector open the water valve and steam valve, then, by pulling out the lever, steam is admitted to the injector, draws water from the tank, closes the overflow, and feeds the water into the boiler. The favorable results given in numerous practical applications of this injector are the best proofs of its efficiency. Although designed particularly for locomotives, it may be applied to stationary boilers.

A. Aller, 109 Liberty St., New York City, is agent for the manufacturers.

## Earnestness in Business Pursuits.

The *Industrial World*, of Chicago, in the course of a stirring editorial, gives expression to the following worthy sentiment:

There is a difference in the interest which men have in their trade or calling. Some interest themselves because they think of the money they can make; while another and better class think only of the advancement and progress of their art or trade. The man who paints pictures solely for money may master the details of his art, but it is doubtful if he can throw a truly artistic inspiration into his work. The inventor who strives to find some new discovery may be goaded on

to his labors by a desire for gain, but the greatest discoverers of the world have been men whose ambition for wealth was subordinated to their love for their work.

There is need of earnest workers in the land. We want them to crowd out the sluggards, to form the advance guard in the arts and in the sciences, and to be the promoters of the great enterprises of the day. We want them to displace the half-hearted, sleepy-headed workers that now infest every trade, and which bring such ruin and havoc in every kind of business. It is to the earnest, faithful, interested men that we may look for carrying on the wonderful work which has been begun in this country in almost every department of art, science and trade. In the keeping of such workers the destiny of our country is secure, and so long as we fill up their depleted ranks, so long we may expect to maintain our national honor and greatness.

### Improved Die-Sinking Machine.

The improved die-sinking machine, shown in the accompanying engraving, is built by Cox & Prentiss, of Cleveland, O.

This machine, as a whole, weighs about twice as much as the style formerly built by the same firm. It weighs, complete, about 2,800 lbs. All the working parts, such as the knee, and the cross beam which carries it, are very much enlarged to insure greater stiffness, while subjected to working strains. Formerly, the table and cross beam were raised and lowered by means of a hand wheel, and bevel gears connecting with the lifting screw, which was located at the side of the machine. This arrangement had the effect of binding the cross beam as it was tipped to one side, which created undue friction. In the machine shown, the lifting screw is located in the middle of the slide, thus taking the strain more direct. The nut is operated by means of two bevel gears within the cross beam, attached to a shaft having a crank at the end, within easy reach of the operator.

The cone has three changes of speed, and is driven by a 4-inch belt. The upright spindle is also driven by a 4-inch belt, passing around a 14-inch pulley on the end of spindle, and a pulley of the same size on cone shaft. The horizontal spindle is driven by gears, which may be disconnected by means of a clutch, shown in the illustration.

Both the vertical and horizontal spindles are made of the best hammered steel, and are accurately fitted to their bearings. The knee that carries the working table is supported by a heavy steel pin, secured in the cross head. The table may be inclined by a steel worm, working in teeth cut on the lower edge of the knee for that purpose. To secure the knee in any position still more firmly, there is a steel clamp-screw placed in the slot, as shown. The cross head has a horizontal movement on the cross beam of 16 inches, and the table can be moved up and down 17 inches. The movement in and out from the face of column is about 8 inches. The vise for holding the work upon this machine was illustrated in a previous number of the AMERICAN MACHINIST. It was designed especially for this machine, and enables the operator to turn his work in any position without loosening it.

In the United States there are 560 cities and towns, which have hydrant water supply, adapted to the use of water motors.

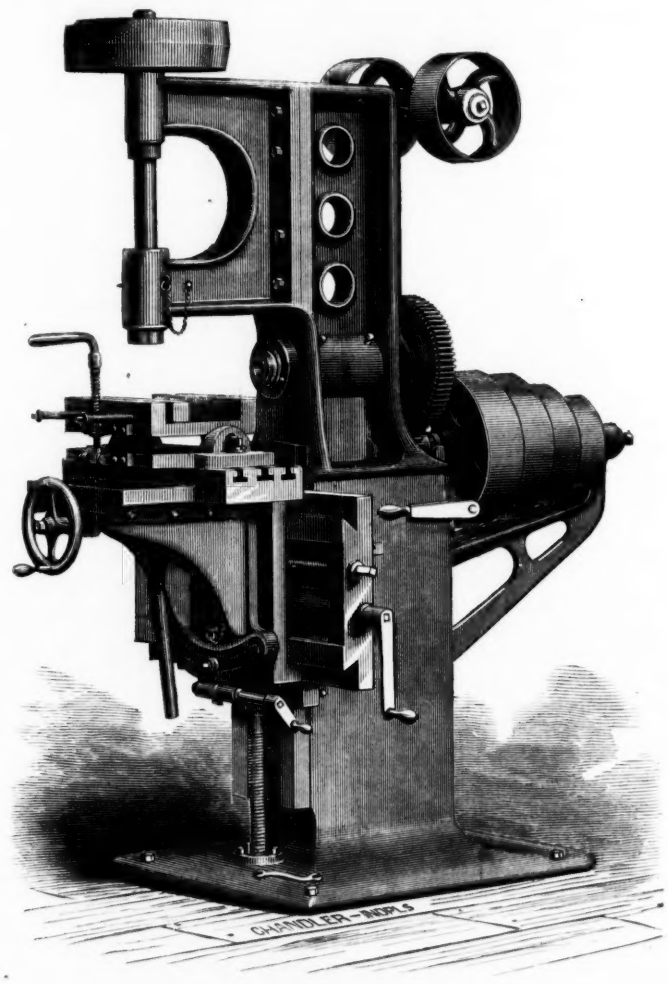
## LETTERS FROM PRACTICAL MEN.

### Nickel Plating.

*Editor American Machinist:*

I wish to say a few words for the benefit of those amateurs who, like myself, have a desire to do nickel plating on a small scale. About two years ago I made up my mind to do some nickel plating for my own use, and was very much troubled to gain any information about it that was useful to me. I remember that the one thing that gave me most trouble was the proper cleaning of objects, so the nickel would not peel off. It was a year or more before I was successful. I purchased several books and followed many different ways of treatment, but the result was always about the same; and after all my experience in the matter, I found that the following way gave me perfect success every time, for all small brass work or any of the soft metals: If the work be new, it should be brought down to a fair surface with the file and fine grades of emery paper, and then finished on a felt wheel with tripoli; that prepared in cakes is the best and most convenient, as it can be held against the wheel while running, and thus the wheel will be well charged without stopping the lathe. After the work has been well polished in this way, it should be cleaned in benzine or lye to remove the adhering particles of tripoli and dirt. Now the final high polish may be given with the rag wheel and rouge, when the article will be in readiness for the last and most important part of the cleaning, which is done with precipitated chalk made into a thick cream with just enough ammonia water to give it a sharp smell. Now hold the articles in a pair of wooden plyers, or in any way to keep them from coming in contact with the hands while they are well brushed over with the chalk mixture. Then they should be rinsed in running water, and if there is no part that is not covered with a film of water, they are ready to be placed in the circuit as soon as possible; but if there are spots where the water does not cover the object, the work shows imperfect cleaning, and should be gone over again as before with the chalk and rinsed. The bath should be composed of sulphate of nickel and ammonia, with pure rain or distilled water, and the strength should be 7° Baume's hydrometer, or about ten ounces of the salts to each gallon of water. The bath should also be kept as near neutral as possible by testing with litmus paper and adding small quantities of ammonia or sulphuric acid as the case may demand. The length of time the object should remain in the bath depends on the thickness of plate wanted and strength of battery. A weak battery and longer exposure will give best results. If the battery be too strong, the objects will assume a gray, rough appearance. I hope the advice given above will prove a benefit to some young amateur who has tried his hand at this beautiful art and failed as I did at first. W. S. HARRIS.

Croton Falls, N. Y.




IMPROVED DIE-SINKING MACHINE.

### Standards of Measurement.

*Editor American Machinist:*

In your issue of July 2nd, above the signatures of Messrs. John Ortton and M. M. Forney, there was a "Report of Committee appointed by the Master Car Builders' Association." That portion of said report showing how a standard yard was procured is not quite clear, and, if permitted, more light is earnestly requested. Our reason for asking should be quite clear, for surely no one is more desirous of obtaining true measurements than we are; and none have spent either the time or money which has been, up to this moment, laid out in tools and processes for obtaining correct results, our gauge-plant being the largest anywhere. After touching upon the difficulties of obtaining a correct yard, and correct measurement of that yard in this country, the "Report" says: "It then became necessary to have a standard yard verified in London." The inference deducted from this is, that the London yard was absolutely correct. If so, why?

As no two measurements of bars made in this country were the same, "*nor no*" two bars made here were alike, we should be pleased to hear if the London measurement agreed with any made here. If so, whose?

The bars for lineal measure in possession of U. S. Coast Survey are duplicates of the British standards, less difference due to ten degrees of temperature; hence we should like to be informed of the difference in measurements made in Washington, and those made in London, if there was any; and, if any, what guarantee is there that the yard just verified for the Pratt & Whitney Co. agrees with either? JAS. A. TAYLOR,

Manager Gauge Department,
Betts Machine Co.

Wilmington, Del.

### Management of Steam Boilers.

*Editor American Machinist:*

As much is being said in the columns of the AMERICAN MACHINIST on boiler management, perhaps it will be interesting and also beneficial to young engineers to mention some of the effects of leaks coming in contact with the outside shell of boiler.

Every engineer should guard against such leaks as far as possible, as it takes but a short time for the corrosive action of the water to eat its way through the shell.

The writer recently examined a flue boiler that had been in use for a long time in a manufactory. The building having been consumed by fire, the masonry was removed, and the boiler was found to be in a very dangerous condition. The top sheet to which the safety valve was attached was eaten away directly under the mouth of the safety valve—so thin that the writer could easily thrust the small blade of his pocket knife through it, and by striking the shell with the corner of a brick could produce quite a dent; however, the boiler internally was in very good condition and free from scale.

In my opinion it was a fortunate thing that the building was consumed by fire, as not until after the masonry had been removed had anyone the remotest idea that the boiler was unsound, and without doubt at some future time the result might have been loss of limb and life.

A leaky safety valve was in this case the sole cause of destroying the sheet. As there was no pipe connected with escape end of the valve, the water was constantly dropping on the sheet at this point, and in time caused the result above mentioned. No doubt the flange also leaked to some extent, thereby contributing to the destruction.

On examining the seat of the safety valve it was found to be badly cut, indicating that it probably had not been ground to its seat since the boiler had been in use. This gave further evidence that a leaky safety valve was the cause of the corrosion of the sheet.

I would recommend keeping stuffing boxes, pipes, unions and flanges perfectly tight, as this constant dripping will in time produce the results as before mentioned.

To prove this to the inexperienced engineer it is only necessary to call his attention to the feed pipe on the furnace end of some boilers which are sometimes situated under a set of leaky gauge cocks where the water is constantly dripping on the pipe. I have seen feed pipes on boilers that have been from this cause reduced to one-third their former thickness, not only rendering it unsafe to work in front of the boiler but causing needless expense, where if a drip pipe had been used to convey the water from the gauge cocks, or care had been taken to keep them tight and in good order, this needless expense and danger could have been avoided.

By all means avoid locating tanks, return tanks, etc., directly over the boiler, as is sometimes practiced to save room. When a leak is discovered in any part of the boiler, no matter how trivial, examine and stop it the first opportunity that may occur. If under the masonry, do not neglect it on that account, as such seemingly trifling and insignificant leaks will in time perhaps lead (and in fact often have led) to very serious results.

A stitch in time not only saves nine, but sometimes saves lives and property too.

Beverly, Mass. SMOKE ARCH.

### Loose Pulleys on Line Shafts—Tool Posts.

*Editor American Machinist:*

In Mr. C. E. Simond's first article he refers in very positive terms to tight and loose pulleys on main line shafts. I differed with him and so explained it; but in his letter of May 21 he entirely ignores his original article, and attacks my position on the assumption that I ignore loose pulleys altogether. He jumps in his discussion from loose pulleys on line shafts to loose pulleys on lathes, elevators, &c., all of which is foreign to the original question. Mr. Simonds claims attention to his views by reason of his daily experience, which he would have us infer is very extensive. I claim to have had a little of that article myself, having put in about 28 years as apprentice, journeyman, tramp and foreman, and have plenty of room in my loft for more experience, and then I do not expect to know it all. But it is necessary to stick to the text in a discussion. The text in this instance is tight and loose pulleys on main shafts. In his letter of April 9th, Mr. S. says: "If every owner of steam power would positively require that each and all of his tenants should place on his main line shaft a tight and loose pully, etc.," but he digresses from the text and asks me if I ever saw a belt elevator. I am familiar with almost all descriptions of elevators that are in general use, from the rope and windlass used by the coal miners of Illinois, which lower and raise themselves out of the coal pit, to the expensive steam

and hydraulic elevators used in the mines of Colorado and Nevada, also the immense elevators used here to unload the grain out of propellers. This much I give in explanation. I should like to ask Mr. S. how he can harmonize his two statements. He first declares the use of an idler poor practice, and in a subsequent article he says that by the method he proposes only a small hole is needed to use an idler. He condemns my suggestion in one place and claims it as his own in another. (I would have him bear in mind that I am very jealous of the AMERICAN MACHINIST, and that I preserve every number, so I can refer to any article in it.) Mr. Simonds says that by my method of using an idler a large hole is required in each floor. Will he please explain why he thinks it more economical by his method of having a hole twice the width of the belt for shifting to and fro from tight and loose pulleys on the main line shaft? I proposed a hole the width of the belt, so as to allow the idler to take up the slack of the belt. I always box in the open space to avoid accidents.

* * * * * *

I would say in answer to "G. G." in a late issue, that it used to be a common thing down South to have two tool posts on the carriage actuated by the same screws, so that when the lathe was reversed the tools would cut both ways. We were accustomed to use that device in cutting screws for cotton and tobacco presses. E. E. JOSEF.

Buffalo, N. Y.

### Friction of Belts.

*Editor American Machinist:*

I note Mr. Halsey's article on belt friction in the AMERICAN MACHINIST of June 18th. Gen. Morin's experiments differ very little from mine. He made the coefficient of friction with an old belt—0.279—on a smooth iron pulley, at 180°. Mine show 0.345, instead of .245, as Mr. Halsey states it. Now, this is friction *at rest*, not friction at a *high velocity*. I have no data to determine that, farther than what I know a belt will drive from long experience, and I do know that my rule of 600 feet per minute, per inch of width, is good, in spite of Mr. Halsey.

There is good reason to believe that a belt moving at 2,000 or 3,000 feet per minute exercises a much larger strain on the surface of the pulley than any coefficient of friction obtained when at rest will show.

My experiments were intended simply to determine the proportion of resistance due to different arcs of contact, without reference to what power might be obtained when in motion; and all my experiments on power go to show that friction increases very rapidly with velocity. There is plenty of room for investigation and experiment in this matter of belt action yet. SAML. WEBBER.

Manchester, N. H.

### Hints on Working Steel.

*Editor American Machinist:*

I read in a paper the other day an appeal to the man "who knows all about annealing steel" to come forward and give the public the benefit of his knowledge. I wonder when, where, and how we shall get this information, and if there is a man who *knows* all about it, whether he will succeed in making the men who *do* the annealing understand all the different conditions required by different steels? The absorption or expulsion of hydrogen gas or carbonic oxide; the presence or absence of sulphur, phosphorus, silicon, manganese or titanium, and their effect will have to be considered with the varying treatment required. Then, if the whole subject comes to be thoroughly understood, I wonder whether "We uns," the workers, will do honestly what "You uns," the thinkers, tell us is the right thing to do; for however much scientific research may be made by men who *know*, and give it to us in figures, it remains a fact that (aside from experiments) the greasy mechanic performs the operation. We want all the light we can get on the quality of iron used as a base for the particular steel under treatment, with proportion of carbon contained, with a knowledge of its condition in the bar, as having been produced or effected by the successive operations through which it has passed since leaving the ore bed; also, knowledge of changes in smelting, puddling, shingling, rolling, cementing, melting, teeming, welding, hammering or rolling to final shape or size. Hours in a state of fusion; days—aye weeks—in a high state of heat, but little below the fusion point, its ultimate value depends no more upon the original quality of material than upon the honesty with which each operation is performed. Shall we have a rule by which we may know at a glance the quality and condition, and from that the treatment necessary?

I earnestly hope that the man will come forward and tell us all about it, just why heating in an open fire and burying, to cool off in embers or sawdust, lime or pulverized charcoal, clamping between two boards or cold water annealing, packing in a box of cast or wrought iron, with a lid luted with fire clay to exclude the air, or not, with the space not occupied by the steel to be filled with charcoal or other matter, or not, as the operator has been taught, with many other methods, are good or bad. I am still inclined to think he will "wait a little."

In the mean time is it not possible that a few points from those who do not know all about it may prove interesting and instructive? To anneal steel it must be heated and cooled gradually. If cooled suddenly it will be harder than before. It follows, then, that a small piece of steel, or a few small pieces, heated in an open fire, and buried in cold ashes or charcoal dust, do not anneal, but are really harder than before. Bury them in hot embers, and let all cool off together, and they will be soft. Pieces which are large enough or sufficient in number, if small, to ignite the charcoal dust or heat the ashes in which they are buried, will be annealed in that way. For annealing a large quantity, the plan of packing and heating in boxes, allowing the steel to remain in the boxes till cold, is undoubtedly most economical, and gives the best results. Packing with charcoal or other material is beneficial, as the accumulation and distribution of heat through the whole mass of steel is more gradual, and consequently more even, while the packing material being ignited holds the heat longer, and protects the steel from the chilling effects of the air when drawn from the heating furnace, or after the fire is extinguished or shut off, if the steel is left in the furnace to cool. "But," says some one, "we know all this; tell us something about the absorption of injurious gases, or the expulsion of others essential to successful treatment, loss of carbon, coarseness of grain, and brittle-weak condition generally." Now, my friends, I may be wrong; it is not from the standpoint of the metallurgist or chemist that I am making observations, but as a mechanic. Yet I boldly affirm that while steel is as sensitive to change of heat, beyond a certain limit, as mercury, inside of that limit it is safe, and may be annealed sufficiently soft for any purpose whatever within that limit. While it is true that steel gives off carbon if overheated until the surface will no more harden than iron—becomes iron in fact—it is just as true that it may be heated sufficiently to anneal, or harden, repeatedly, with no apparent injury, and may be heated or cooled in any way you choose, so that it is *not too hot* for either operation, and is cooled slowly enough for the one and quickly enough for the other. When heated too hot for annealing, steel becomes coarse-grained and weak. Reworking, either hot or cold, or hardening at a low heat, to some extent repairs the damage, but where these restoring agents cannot be applied the result is disastrous. I presume others besides the writer have seen a twist drill accidentally broken half way between the cutting end and shank end, and on examination found it soft, yet twice as thick at the broken part, as at the point. This was because the steel had been overheated in annealing, putting it thereby in its weakest possible condition. The hardening process had not reached far enough up from the point to repair the damage, as it would have done, to a great extent, if the drill had been hardened the whole length. Here we have, then, an apparent anomaly. The point of the drill, in its supposed brittle condition (hardened), stands under the same strain which breaks the part twice as thick, of same width, in its supposed strong condition (soft).

Just here I am interrupted by a man from New York, who is introducing a "Magic Steel Carbonizer." Quoting from the circular left for my perusal, this M. S. C. "produces results heretofore unknown to the oldest and most skillful mechanic. It enables the ordinary mechanic to do that which the best have considered impossible to do without it. Steel may be safely welded and worked at iron heat, and at the same time become improved. Steel burned in its worst form may be restored, and made better than before burned." "*It speaks for itself.*"

Yes, very emphatically it says to every mechanic who is overheating steel for the fun of restoring it: Investigate, experiment, learn more about this wonderful composition—steel, and the laws which govern it. Don't take for granted anything that any man says about it, when you can settle the question for yourself by a few experiments and the waste of a few pounds of steel. Burned steel can be restored by the use of fire, air and water, but *don't burn it* is the advice of

S. W. GOODYEAR.

Pittsburgh, Pa.

### A Steam Bouncer.

That a steam bouncer actually exists, and is in practical use in this city, not far from the office of the AMERICAN MACHINIST, was definitely proven a short time since. So say the insurance inspectors who got bounced. In a large establishment where the steam bouncer is located there is stored a quantity of combustible material in the shape of high wines and oils. The store-room is upon the sub-basement floor, surrounded by four brick walls with iron doors. Upon the ceiling, running lengthwise of the room, are three perforated iron pipes reduced from 1¼ inches at one end to ¾ inch at the other. When a fire occurs in the store-room, by closing the iron doors and opening a valve attached to a main pipe, of which the three pipes referred to form branches, the room is filled with steam and spray in a very few seconds. This extinguishes the fire.

One day, lately, some insurance agents came around to see what risks their companies incurred, and what the facilities were for extinguishing fires. They were met by the superintendent of the building, when the following dialogue occurred:

Agent: "Good morning, sir. We represent the insurance company, and would like to examine the building."

Supt. "All right. By the way, let me show you our new extinguisher down in the store-room."

The superintendent led the way, and the agents followed, expressing themselves very skeptically in regard to "new methods for extinguishing fires." In the store-room the superintendent attempted to explain the apparatus, but the agents interrupted him by asking him what was used for extinguishing the fire. Upon being told it was steam, one exclaimed:

"We have heard of something of the kind before, but have no faith in that sort of thing. Where is the apparatus?"

Supt. "Perhaps you would like to see it work?"

Agent: "Oh, yes; turn it on."

Supt. "If you will be kind enough to step outside the door, I will oblige you with pleasure."

The agents, supposing the apparatus was at the farthest end of the room, refused to go out, and one said, "Oh! we understand all about those things and are not afraid. Turn it on." The superintendent remonstrated, but all to no purpose; so, thinking he would open the valve gradually, seized hold to turn it slowly, but the valve stuck, and when more force was applied the valve flew wide open. The next thing that superintendent saw was a badly-scared insurance agent coming out of the door, followed by a flying hat in a cloud of steam, with agent No. 2 bringing up the rear, on all fours, half suffocated and covered with water and iron rust. The water was not hot, the pipes not having had time to get heated. So the only injury done to the agents was the soiling of their clothes and the scaring of them almost out of their wits.

After gathering themselves up, one said: "Well, sir, that is really a good thing; and we shall take early occasion to bring it to the attention of our company with a recommendation that they indorse it. But my—! What a wonderful power there is in the force of that steam!" They went off muttering something about quietly submittingto the rough manipulations of a steam bouncer.

### Another Wonderful Motor.

Keely seems to be reasonably well settled at last. This time it is a motor for electric generators, the location Cincinnati, and Col. Minor the individual. The Troy *Daily Times* graphically describes it (the motor) as "a cube of fifty inches dimensions, with two cylinders 7 by 7 inches."

The description further refers to a "Maltese cross," a "cut off bar," and other accessories. The engine is said to be capable of running at 300 to 600 revolutions per minute, and by the combination of its two pistons with the Maltese cross, the cut off bar, and a yoke, "the yoke is given a kind of pendulum motion, throwing the power at all times on a certain point of the shaft, preventing the engines getting on the center, and creating an even revolution." Any description of this motor, however lucid, pales before the account of its performance. In other modern motors, designed to get something for nothing, there is abundant evidence of some mysterious agency at work—something suggestive of the miraculous, and which won't be investigated.

There appears to be nothing of the sort here. True, we quote, "This engine is capable of developing a power which sets aside all theories, and bids defiance to all established rules for calculation;" but that is nothing—comparatively—so long as it is done legitimately. We have become so accustomed of late to seeing theories set aside and rules defied that it comes quite in the course of nature. There is not at the present time the slightest objection to getting outside physical laws, provided you show the world what you overturn them with. What follows relieves the whole subject of anything mysterious. We again quote: "This engine" (note, that engine is a much better word than motor) "with 100 pounds steam pressure and 360 revolutions per minute, will have 1,000 horse power, and by trials it has been demonstrated that seven bushels of coal are sufficient to run it ten hours." Here is the whole matter clearly and sharply defined: two cylinders, each 7″ by 7″, at 360 revolutions and 100 pounds steam pressure, developing 1000 horse power with a consumption of about $\frac{7}{100}$ pounds of coal per horse power. That statement appeals to the party who pays the coal bill. With this knowledge at hand, of what further interest is any particular combination of yokes and Maltese crosses? What does he care about the result being more than theoretically perfect? Was not the motor designed to "set aside all theories?" Why should he submit a thing to vulgar calculation that was built to defy calculation? What a field for speculation! not the sort of speculation which is concluded by the dollar-and-cent consideration, but the real genuine, philosophical disquisition. Consider this motor as in its infancy, and let its progress be as rapid as that of the present (or past) type of the steam engine has been, and to what extent must that $\frac{7}{100}$ pounds of coal be reduced to express the economy rating of this motor ten years hence? Who can conceive the great moral and commercial significance of every man's owning and operating a 1000 horse power engine, when he can buy a pair of 7″ cylinders—with a Maltese cross and a few unimportant belongings—and pay for a bushel of coal? What a blow this will be to coal monopolies, and what is to become of predicted coal famines, are questions that suggest themselves. We shall hear no more of utilizing Niagara. No sane man would invest upon any scheme for bottling up elec-

tricity with 1000 horse power steam engines, or motors smaller than a country wood box, and guaranteed to run indefinitely on a shovelfull or two of coal.

### The Richardson Anti-Friction Slide Valve.

The slide valve illustrated on this page is the invention of George W. Richardson, as a result of knowledge gained from many years' practical experience as a railroad mechanic and engineer. It will be seen that the valve proper, as here shown, does not differ from the ordinary locomotive slide valve except in the means employed to relieve the valve face and seat from a part of the enormous pressure under which the ordinary slide valve works. In fact, a peculiarly valuable feature would seem to be the facility with which this valve can be modified, rendering it applicable to cylinders designed for long or short slides, either with or without a supplementary cut-off. Referring to the illustrations, of which Figs. 1 and 2 are transverse and longitudinal sections through the centers of an ordinary locomotive steam chest fitted with this valve; Fig. 3, a plan of the valve, and Fig. 4, an elevation of one of the packing sections and spring, the only alteration made is the addition of the balance plate *A*, and the substitution of a valve suited to receive the packing sections *p p p p*.

In the present instance the balance plate is bolted to the steam chest cover; but it is obvious that it may be cast in one piece with it if desirable. As will be noticed, the four sections of packing enclose a rectangular space *s*, which is made equal in area to the amount of valve surface which it is desirable to relieve of pressure; the packing sections preventing steam from entering this space, and its communication with the exhaust port in the valve through the small hole *h*, relieving it from any pressure that might otherwise accumulate. These packing sections—four in number, as previously noticed—are: the two longer ones plain rectangular pieces of cast iron, while the shorter ones, as shown in Fig 4, are make with gib-shaped ends to retain them in place. They are all provided with light springs—one of which is shown at *m*, Fig. 4—which serve the purpose of holding the sections against the balance plate when steam is shut off. While in operation the different sections are held in steam-tight contact with the balance plate, and, with the inner surfaces of the grooves planed to receive them, by direct steam pressure, the joint being made complete by the abutting of the ends of the long sections against the inner surfaces of the gibbed sections at the four corners. It will be noticed that the hole *h*, previously referred to, passes through a projection on the back of the valve. The outer surface of this projection is made to extend a little beyond the rest of the valve surface, so that when running shut off (as in the case of the locomotive), the partial vacuum in the steam chest will hold the valve against the balance plate, the surface of this projection moving in contact therewith, and preventing sparks or dirt from being drawn into the space *s*, to the detriment of the packing.

The peculiar feature of this valve is the packing, for which the inventor claims that each of the four sections of which it is composed being in its action entirely independent of the other three sections, and, as he describes it: "Never crossing in its travel the line of travel of any other section," insures its remaining tight till worn out.

We are informed that quite a large number of these valves are in use—some of them having been in constant use for a number of years—and are giving general satisfaction; frequently, as in the case of the ordinary locomotive, relieving a single valve seat of pressure equal to 10,000 or 12,000 pounds.

This valve is manufactured by F. W. Richardson, Troy, N. Y.

### Cleaning out Lime Incrusted Water Pipes.

One of our correspondents writes: "As a sort of 'shop kink' I give you a curious experiment tried on an engine water-supply pipe that had become choked up with lime incrustation. After hammering it for an hour or two and kindling a fire all over it, without any result, one end was plugged up, and about a pint of refined coal oil was poured in the other end—all it would hold—leaving it stand all night. The next morning the entire mass slid out, a solid lime core. Before trying this we thought of throwing the pipe away as useless, and getting a new one."

### How to Melt Iron Rapidly.

BY THOS. D. WEST.

Good management in melting iron, to the observer, is only indicated by the amount or weight of iron and fuel used in charging up a cupola, and by the time consumed in melting. This information is good, as far as it goes. A man knowing this much, if he had the cupola prepared, could charge it up and melt iron, and have a fair success so long as the grade of iron, fuel and working conditions did not change. In reading in the AMERICAN MACHINIST, of June 18th, an article entitled "Fast Melting," by Edward Kirk, also one published last winter, by

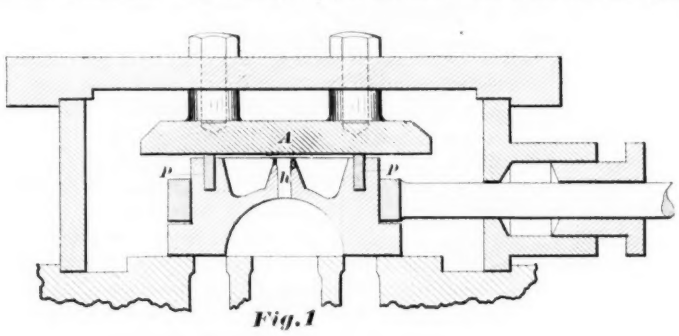


Fig.1

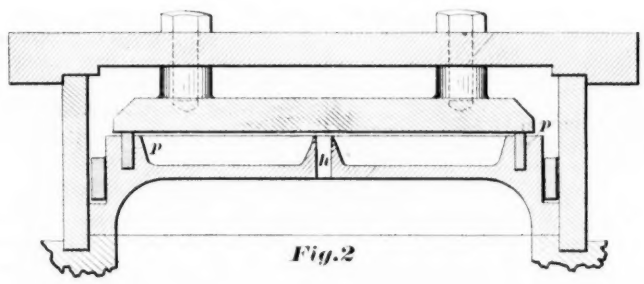


Fig.2

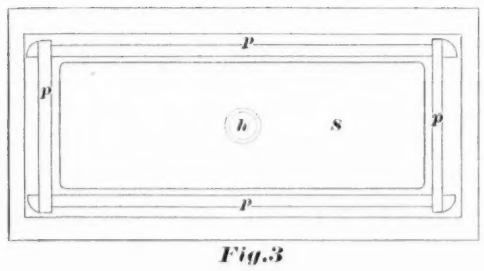


Fig.3

Fig.4

George H. Thomas, I was sorry to see that there were no practical notes or hints on the true cause of fast melting given, as evidently either gentleman could have written, some points that would have been of value to iron melters. Since their cupolas melted extra fast, the tables of charges of iron and coal that are given would not help a melter who is troubled with slow melting.

Mr. Kirk does give one hint, and that one might have suggested the remedy for slow melting. He says that his coal was all small and broken. This would make a more solid and heating fire, as when the coal or fuel is large it acts similarly to taking a single lump of burning fuel on a shovel, and letting a blast blow on it. This, instead of making an increasing fire, soon blows all the life out of the fuel.

The arrangement of Mr. Kirk's cupola is, I think, very good for rapid melting, as he has plenty of blast and a very high charging door, it being 13½ feet from the bottom. I should object to having a door so high for a cupola that had to melt iron of different grades during the same heat, such as iron for a cylinder, pulleys, or a roll, as the upper charges, if a poorer grade of iron, would melt before reaching the melting point, and would get mixed with iron of another quality. A good height for a door in a jobbing shop cupola is about nine feet from the bottom plate to the bottom of charging door. This will make the iron hot by the time it gets down to the regular melting point, so that it will not take long for it to melt.

Take a cupola constructed as Mr. Kirk's is described to be, having all one grade of iron to melt, and when charging up, instead of laying the iron so as to cover over all the fuel, lay in the iron so as to leave a hole in the middle. Then, when you put on your other charges of fuel, each charge will connect with the lower charge all the way up in the form of a cylinder or burning body of fuel from the bottom to the top; causing the top charges to be in a melting state before they get down to the regular melting point.

In my practice, whenever I wanted to melt rapidly, I always had my pig iron broken small, as pig iron melts at the ends first. If the pigs had too much sand on them, I would have it knocked or brushed off. The gates and sprues should be jingled in the tumbling barrel, and the fuel should be free from all dirt. Instead of making the charges all the same weight throughout the heat, I would make every other two charges lighter. For instance, starting at 4,000 pounds for the first charge, the last charge would be, according to the heat, from 2,000 to 1,000 pounds, as a cupola never is in as good condition for melting iron toward the latter end of the heat as at the first. This way of charging brings your fuel and iron closer together. In charging up, the iron should be laid in loose, so that the flame can get a good chance at it, and the fuel should be put in compactly, so as to make a solid fire. The charges should never be allowed to get below the charging door until all the iron is in. It is also of great importance to use some oyster shells or limestone to clean the iron. The slag and dirt should be let out of the cupola when there is any collected.

### Newly Incorporated Companies.

ILLINOIS.

The Machinist Supply Company; incorporators are E. Hamilton Hunt, John W. Weston, and William M. Baker; Capital, $25,000. To manufacture, buy, and sell railway and machinist supplies, machinery, tools, &c. Location, Chicago.

The Anglo-American Company; incorporators are A. W. Dunlop, John Beckwith, and Robert Simpson; Capital, $250,000. To do general farming and manufacturing in the State of Illinois and elsewhere. Location, East St. Louis.

Lithia Spring Distilling Company; incorporators are Ferdinand A. Bensberg, William J. Bensberg, and Gerhard Bensberg; Capital, $25,000. To manufacture, make, and distil spirits from grain or other material, and vend the same. Location, Beardstown.

The Rochelle Manufacturing Company; incorporators are M. L. Ettinger, M. D. Hathaway, Edward Gardner, and others; Capital, $50,000. For manufacturing purposes. Location, Rochelle.

The Chicago Philadelphia Pressed Brick Company. Incorporators are—Peter H. Beveridge, George H. Caster and John K. Cadwell; Capital stock, $30,000. To manufacture and sell Pressed Brick and other grades of brick. Location, Chicago.

Chicago Union Railway Company; George L. Dunlap, Charles C. Bonney, Charles L. Bonney, John L. Beveridge and W. W. Hill, all of Chicago, Ill., incorporators. To construct and operate a line of railroad from some convenient terminus at or near South Chicago Harbor, thence westwardly to a point at or near the western boundary line of the Town of Lake; thence northwardly to the west of the City of Chicago, to some point in the Town of Jefferson, and thence eastwardly to some point on Lake Michigan in the Town of Lake View, all in Cook County. Capital stock, $2,000,000. Principal office, Chicago.

Tamaroa, Mount Vernon & Vincennes Railway Company; Charles B. Cole, Chester, Ill; Wm. K. Murphy, Pinckneyville, Ill.; George W. Evans, Mt. Vernon, Ill.; Robt. A. D. Wilbanks, Mt. Vernon, Ill., Alvah Blanchard, Tamaroa, Ill., incorporators. To construct and operate a line of railroad from the Town of Tamaroa, in Perry County, Ill., by way of Mount Vernon, Jefferson County, Ill.; thence by the most practical route to a point on the Wabash River, opposite the City of Vincennes in the State of Illinois. Capital stock, $1,500,000. Principal office, Mt. Vernon.

MASSACHUSETTS.

Charles F. Bates Manufacturing Co., Boston; Orrin B. Bates, President; Charles F. Bates, Treasurer; Capital, $50,000. For the manufacture and sale of essences, flavoring extracts, perfumes, soaps, and toilet articles.

Springfield Electric Light Co., Springfield; Gideon Wells, President; H. S. Hyde, Treasurer; Capital, $10,000. For the generation and distribution of electricity for lighting and other uses, the manufacture and sale of apparatus therefor, and in connection therewith.

NEW YORK.

Poughkeepsie Iron and Steel Company, New York; Sheppard Homans, Henry A. Jones and Joshua W. Houchin, incorporators. Capital, $100,000. For the manufacture and sale of iron and steel in any form and the purchase and sale of mines and ores.

The Myrtle Avenue Branch Railroad Company, Brooklyn; Directors, John Flynn, John N. Oitel, Simon Young, Alais Lazansky, Alex. McLean, Peter Alsgood, Joseph Wedemeyer, Claus. Hohorst, Geo. Wilson, Geo. Thinkel, Herbert Feam, F. Hoohshall and C. W. Van Glahn. To construct, maintain and operate a railroad, commencing at the main line of the Brooklyn Underground Railroad, near its intersection with the center line of Myrtle Avenue, thence along and under Myrtle Avenue to its intersection with Broadway, with such branches, turnouts, switches, stations, etc., as may be required for the use and operation of the road. Length of road, three miles.

The Bergenport Zinc Company, Deer Park and Mount Hope, Orange County: Franklin Osgood, Wm. H. Osgood and Leonard Richardson, incorporators; Capital, $1,200,000. To mine, work and smelt ores, and the manufacture of zinc products.

Edison Electric Light Company of Cuba and Porto Rico; Thos. A. Edison, G. P. Lowrey, Geo. W. Soren and Fausto Mora, incorporators; Capital, $1,000,000. To manufacture, sell, operate and license the use in the islands of Cuba and Porto Rico of various apparatus used in producing light, heat or power by electricity.

Edison Electric Light Company of Havana; Thos. A. Edison, G. P. Lowrey, Jose F. de Navarro, Geo. W. Soren and Fausto Mora, incorporators; Capital, $1,000,000. To manufacture, sell, operate and license the use in the city of Havana, in the island of Cuba, of various apparatus used in producing light, heat or power by electricity.

The Pearl Manufacturing Company, New York; Adolph Pearl, Joseph Wise, Jno. L. Knox and Henry Pearl, incorporators; Capital, $100,000. To manufacture and sell centrifugal machines for casing and drying tobacco and other staples, and the manufacture of tobacco, cigar and cigarette machines.

Hamburg Axe and Edge Tool Company, Hamburg, Erie County. Jacob Peffer, Simon Sutler and Randolph Stratemeyer, incorporators; Capital, $8,000. To manufacture and sell axes and edge tools generally.

Dunkirk Knitting Mills, Dunkirk; Walter C. Cotton, Wm. T. Cohnan, Emil Keller, and others, incorporators; Capital, $10,000. For the manufacture and sale of knit goods and merchandise.

Hubbell Stove Company, Buffalo; Henry S. Hubbell, Alfred S. Hubbell and Marcus A. Hanna, incorporators: Capital, $60,000. For the manufacture and sale of stoves.

Mount Ferrol Iron Company, New York and Philadelphia; Wm. H. Carr, Jos. H. H. Williams, and Richard H. Spencer, incorporators; Capital, $1,000,000. To own, work and lease mines in Washington County, N. Y., to extract therefrom such iron and other ores as they may contain; and to manufacture the same into the various forms and uses for which the said ores may be used. To purchase, build and operate furnaces.

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NEW YORK, JULY 16, 1881.

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## Successes and Failures of Shopmen.

The whole object of shop work and shop calculations is not, or should not be, to turn out an excellent product, and sell it for a first-class price. Especially should the workman for wages in any shop keep steadily in view one object, and firmly set his face against any persuasive influence that would interfere with its attainment. If he be a man of family his noblest object should be to decently provide for that family, not only when work is plenty, as it is now, at good wages, but as well when work shall become slack, and the word "journeyman" shall have a literal and perhaps an unpleasant meaning. If the workman be without family cares he will, if possessed of ordinary ambition, look forward to the time when he will live for something higher even than any mechanical aspirations. When every branch of the machinery industries is active, almost beyond precedent, as it is now, this subject can more profitably be considered than when opposite conditions prevail. One of the greatest truths in the affairs of men is the old saying, that "History repeats itself." There is nothing to warrant the assumption that the ups and downs of mechanical industries will not be experienced in the future as they have been in the past.

Not a few mechanics, both skilled and unskilled, have vivid recollections of tramping from shop to shop a few years, or perhaps only a few months ago, in search of work at almost any living wages. There was not work enough for all, and some had to tramp or try other kinds of employment, for which they had no taste and no previous training. Who shall do the tramping when another era of depression comes—as come it will, sooner or later? This question is, in a large degree, being answered at the present time. The mechanics who *will not* then be tramping may now be found steadily at work, many of them saving a little from every week's earnings for a future contingency, and placing it where it can be at once obtained when needed. The men who *will* be tramping, while their families suffer abject privations, may, a large part of them, be picked out, in the present state of business, from shops where grumblings and threatened disturbances crop out in efforts to coerce proprietors into granting some new concession which they are not willing to make. "The old, old story" will be repeated in the future as it has been so often in the past, and some mechanics will not learn wisdom at a time when it will prove the most profitable to them. But those who read to improve themselves, and who intelligently consider their future prospects and the comfort and well-being of their families can be trusted to make the best use of the opportunities which constant employment in these active times indisputably affords.

## Capacity of Shop Tools.

In these busy times, when it is of the greatest importance that each and every tool in a shop be worked to its full capacity, it is a singular fact that the majority of proprietors and superintendents of shops do not consider the true principles that lie at the foundation of producing work quickly and accurately. It is astonishing that so valuable a tool as the milling machine, which is capable of doing a greater variety of work, and with greater facility and dispatch, than any other tool used in machine shops, should have been for so many years neglected. Much of the work which is now done with a hammer, chisel and file, or by a slow process upon a planer or shaping machine, could be done in half the time upon a milling machine.

We are glad, however, to see the milling machine gradually winning its way into favor, particularly into railroad shops where it has hitherto been so little understood. Wherever one milling machine has found its way into a railroad shop, and its practical advantages have been demonstrated, a second machine has soon followed, on account of its being especially adapted to locomotive work. For producing irregular shapes, there is no machine that can compare with a milling machine; and in cutting key ways it stands first and foremost. Until it is put to a practical test no person can have a proper conception of the capacity of this machine. The planer also is a tool which is capable of producing a great deal more work than is generally supposed. Many proprietors and superintendents of shops adhere to the old speed of 11 feet per minute for ordinary planers, and in many cases a greater speed could not be attained on account of the hardness of the material to be worked. We visited a shop not long since, where the planers ran at a speed of 24 feet to 27 feet per minute.

Perhaps some of our readers will desire to know how it is done, and our reply is: by properly preparing the castings for the machine.

The castings are made of iron of a proper mixture; they are cleaned from the sand and pickeled over night. When possible they are tumbled, to thoroughly clean the surfaces. This course has been found to be the most economical. As the best proof of this, we will say that the concern referred to is ahead of its competitors in producing work cheaply, and of the best quality. When castings are made largely of scrap iron of a poor quality, and improperly cleaned, the result is a damaging loss of time in working. When the surfaces of castings are chilled, and of uneven quality, it is impossible to make quick time. This can only be done when the metal is of an even temper. Turning chilled rolls requires a great deal of time, and is a very slow process at best; yet, when the surface is chilled evenly, greater speed can be attained.

The most profitable investment that many manufacturers could make, and which would yield the largest returns, would be the expense of putting up a pickling bed. The cost is light, and no time is lost as the pickling is done over night.

The turning lathe is a machine that might be made more efficient without incurring any more labor for the workman. For instance, if he is inconsiderate, and does not properly select the best method of performing the piece of work in hand, he begins to cut the material at the wrong place, faces down a little here, cuts off a little there, and by shifting the carriage and changing the tools much time is lost.

The workman instead of the lathe, has done the work. One of the chief objects of a lathe hand should be to make the lathe do its work. The stock should first be cut to the required length, faced up at the ends, and roughed out, after which it may be finished.

In turning a long tapered piece of work we have seen a lathe hand set the tail-stock of his lathe over to about the position which he thinks will be right; then run a cut across the work. In this way we have seen several hours wasted by workmen who actually knew better, but did not stop to consider what they were doing. The taper should be ascertained at once, and the lathe set so as to require no further changing until the job is finished.

A good, reliable way to set a lathe to turn tapering is to measure a given distance upon the piece to be turned, and turn down to within, say 1-16″ of the diameter required at each end. Then move the tail-stock over until the tool in the tool-post will stand an equal distance from the work at each end of the taper, which may be measured by a tapered iron wedge or a strip of metal. With this precaution there is no doubt upon starting that the taper is right, and the number of cuts to finish the job will thereby be reduced. Some workmen have a peculiar habit when the belt upon the lathe gets loose of either taking lighter cuts and more of them, or of compelling the belt to run upon the next slower speed of the cone. This procedure causes the belt to be greatly injured, and in many cases destroyed by being overstretched, besides greatly increasing the friction upon the journals of the counter shaft and spindle of the lathe.

The speed, too, of the lathe is necessarily reduced. Some workmen seem to have very poor judgment in regard to the proper shape of lathe tools. Whatever the shape used, the tool should have a keen edge and should cut clean.

A round nose tool with a flat top should never be used upon wrought iron, for it will dig off the metal in small pieces; but rather use a sharp-pointed tool having a good angle to the cutting edge, which will peel off the iron as a carpenter's plane takes a shaving from the edge of a board.

It is the practice in many shops to turn wrought iron dry, which is very extravagant. The proprietors of these shops object to the use of water because it rusts the tools and causes too much dirt.

To such we say: Increase the capacity of your lathes by preparing the proper pans to catch the water used, which by the addition of a small quantity of soda will not rust the finest tools. We have heard it argued that truer and better work could be done by working wrought iron dry, but have never seen it verified in practice.

The turret lathe is a very valuable tool, and should be adopted wherever it can be used. It is chiefly adapted for turning screws and bolts of all kinds; and where any considerable number of small cylindrical pieces of work are to be produced, a turret lathe will pay for itself in a short time.

In order to bring up shop tools to their full capacity, the material to be worked should be properly prepared, and the speed of the tool brought up to the point, where the durability of the cutting edge will not be too greatly impaired, to produce true and fine work, and do it quickly.

In reference to the plan for early closing of shops on Saturday, as mentioned in a late issue, full consideration of the experiment by most of the shop owners in New York and vicinity has developed that that project is not admissible to adopt as a rule of action. Most shops are filled with orders for months to come, and are not willing to try any experiments. In some instances the rashness and perversity of workmen in causing strikes has prejudiced the whole matter, and helped the conclusion of most shop owners to make no change of running time. The plan has therefore virtually failed.

Prof. Sweet's series of articles on mechanical drawing begins this week, with some plain directions upon the selection of tools, which will be continued in the next issue. He expresses his belief that the apprentice who is really in earnest about learning to draw will have the few tools here described before the week is out. We advise learners to take hold *at once* and follow Prof. Sweet's instructions, not waiting for cool weather or long evenings.

Chordal reverts this week to the same question he considered in his first letter to the AMERICAN MACHINIST, which appeared in the issue for July, 1878. It will be remembered by our readers that Sackett positively refused to alter details of his machinery to suit customers, while Wyckoff declared he did it every day. Probably most shop owners agree with Sackett, but there are a great many who follow Wyckoff's plan. Chordal's questions in regard to the unit of water power will probably call out some practical information in the answers to them.

## Midsummer Meeting of the Mechanical Engineers.

The midsummer meeting of the American Society of Mechanical Engineers is announced to occur at Altoona, Pa., on the 10th, 11th and 12th of August. The neighborhood of the immense shops of the Pennsylvania Railroad Company located at that place, and the elevated location of the town (which is situated well up on the Allegheny Mountains, has excellent hotel accommodations, and is noted as a summer resort) will doubtless serve to make the forthcoming session of the Society a specially attractive one in many respects. It is understood that the

Pennsylvania Railroad Company will tender suitable courtesies, including a special train for the purpose of visiting the great iron works of the Cambria Iron Company, at Johnstown, Pa.

Anybody who knows the present address of Frank C. Horn, a machinist, who left Cleveland, O., for Akron, last April, will oblige us by sending it to the office of the AMERICAN MACHINIST. The assistance of Mr. Horn will prove of great weight to a poor widow lady in gaining her rights in a legal contest.

### Reasons for so Few Apprentices.

The following paragraph is the opening of a "leader" in the last number of *The Carpenter*, a paper published in St. Louis by an association of carpenters' trade unions.

The AMERICAN MACHINIST and other capitalistic journals, claim that few American youths are learning trades, and all because trades unions have established arbitrary laws that to a great extent shut out apprentices. We desire to inform these journals that such is not the cause. The capitalists themselves keep young men from learning trades.

The above is an example of hastily jumping at an understanding of journalistic views by selecting some single expression, and distorting it into a meaning entirely different from the one intended to be conveyed. The "claim" referred to has not been made by the AMERICAN MACHINIST, nor have we gone to the other absurd extreme in charging "capitalists" with preventing the instruction of apprentices. Some of the trade unions have brought upon themselves an unfavorable notoriety by trying to restrict the number of apprentices in shops.

Their power to do so, however, is very limited, notwithstanding all the noise. The main reasons why there are not more apprentices are: first, the unwillingness of boys and young men to enter upon what they erroneously have been accustomed to regard as not respectable occupations; second, the easy and short way that men may take to become quasi-mechanics, by learning to do a *single operation* in a shop, and securing regular employment at that one thing. The latter way is made possible by greatly improved machinery and processes. The remedy is to elevate the standing and dignity of mechanical occupations; and to this end trade unions, as a rule, do not contribute.

## QUESTIONS & ANSWERS.

*Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.*

Box 9, B., Wardsville, Ont., writes that he has asked certain reasonable questions to which he has never had any answer. The fact that he did not sign his name to his communications may explain why he did not receive any answer, as we take no notice whatever of anonymous letters.

(1) T. D. L., Rochester, Minn. asks: What is the comparative cost of finishing pulleys by grinding and by turning in special pulley lathe? *A.* Something will depend on the size of pulleys; also whether or not they are cast true. Generally speaking, it is safe to say that turning in the pulley lathe will cost less than grinding, and be in all ways more satisfactory. We refer only to cast iron pulleys.

(2) J. G. B., Fremont, Ohio, asks: Can a steam boiler that has a crack or hole in it be repaired by putting a patch over the crack or hole with ⅜" cap screws? *A.* J. G. B. should give particulars as to dimensions of boiler, thickness of plate, location of crack, working pressure, etc. Soft patches are sometimes used for temporary repairs, or in places where it is impracticable to drive rivets, but should not be used where it is possible to cut out the crack and rivet and caulk a patch in the ordinary manner. When used on plates 5-16" or ⅜" thick, the bolts should be ¾" diameter, 12 or 14 threads to the inch, and pitched the same as rivets. The heads of the bolts should be formed to twist off under the squares before the bolt will break elsewhere, leaving a head similar to that of a rivet.

(3) E. B. C., St. Louis, Mo., asks: What is the best work for me to buy in order to learn mechanical drawing without a teacher? *A.* We advise that you study the subject as it is being presented in the AMERICAN MACHINIST by Prof. John E. Sweet. (2) What do you think of the boiler compounds for preventing the formation of scale and removing it after it has formed? *A.* Our advice is, do not use any compound whatever in your boiler unless its use is sanctioned by good engineering authority. There are many so-called harmless compounds which will remove the scale and destroy your boiler.

(4) F. T., Jr., Cincinnati, asks: Can you give me a rule for chasing a screw any number of threads without using a backing belt? *A.* This may be done on any lathe in which the nut of the leading screw is in halves, and made to unlock—technically termed "trip"—from that screw by suitable mechanism. With such a lathe any pitch which is a multiple of the pitch of the lead screw, or any pitch of which the pitch of the lead screw is a multiple, may be cut by simply tripping the nut, moving the slide back by hand, and connecting the nut and screw again; it being impossible to so connect them with the tool in any position but the right one. For any other pitch proceed as follows: Bring the slide, with the tool properly set, back to a position for starting the cut, and note that position with reference to some fixed point, as the tail stock, or a mark on the lathe rill; also make a mark on the face plate, and note its position with reference to its revolution. Then, after the tool has traversed the length of the screw to be cut, unlock the nut, bring the slide back to position noted, lock the nut when the mark on the face plate is in position noted, and proceed with another cut. It will at first be necessary to stop the lathe to note positions and connect the nut and screw, but a little practice will enable you to cut almost any screw without stopping. We have known operatives who removed their backing belts from choice, cutting screws of all descriptions with a single belt.

(5) R. F. P., Asbury Park, N. J., asks: Will you please inform me of the best method of cleaning water-line glasses? *A.*—Remove the glass and clean with a solution of potash, using a swab on a *handle of wood*. Never use a rod of metal, as the glass is liable to break wherever it comes in contact with it, even lightly.

(6) G. E. W., Holyoke, Mass., asks: What is the weight of the counterbalance on a locomotive engine's driving wheels proportioned to? *A.* To the reciprocating parts of the engine and to the unbalanced part of the wheel itself. For obvious reasons the best attempts at balancing the locomotive engine can only result in an approximation.

(7) C. H. S., Toronto, Ont., asks: How can an injector using steam at 40 pounds pressure force water into a boiler at 160 pounds pressure? *A.*—Briefly stated it is because the velocity of the issuing steam at 40 pounds pressure is greater than the flow of water under 160 pounds pressure. The steam passing through the injector is condensed, preserving its velocity, which, as just explained, being greater than the flow of water under 160 pounds pressure, renders it possible to add more water to that of condensation, thereby reducing its velocity until it is just sufficient to overcome the resistance and enter the boiler.

(8) C. P. R., New York, asks: Will you tell me what is the best conductor and what is the best non-conductor of sound? *A.*—Amongst the best conductors and in about the order named, are steel, iron, glass, wood, copper, siver, and tin. Amongst the poor conductors are rubber, leather, woolen cloth, feathers, felt, &c. We doubt if any one is qualified to name absolutely the best or the poorest sound conductor.

(9) D. S., Yngo, San Manuel, Cuba, writes: I have several centrifugal machines driven by friction bevel wheels. The driving bevel is of cast iron, and the cone on centrifugal has its bearing surface of pasteboard, but as it has become worn and does not work, I have taken off the pasteboard and have put on leather, but it does not work well, wears away rapidly, and works loose. Please inform me how I can fix it? *A.*—We do not understand how the leather is fastened. If you will send us a sketch of the driving gearing we shall better understand the trouble. If the proportions are right we know of nothing better than leather for the friction. It must, however, be securely fastened and present a solid surface to the face of the driving wheel.

(10) J. R., Brooklyn, writes: How shall I mould a steam box of lead? I have tried several times but failed. *A.*—Your description of what you want to do is not definite enough to enable us to understand your difficulty. A casting of lead may be made in the same manner as one of iron or bronze. Try again, using pure lead, and if the casting is to be light, warm your mould before pouring. If you do not succeed, give us the exact dimensions of the box, and we shall be better able to assist you. Look to the quality of your lead, as it is often so poor that it will not run fine.

(11) G. W. J., Worcester, Mass., asks for a rule to find the size drill for drilling to tap a full standard V thread. *A.*—A correspondent sends us the following, which we think you may safely use for ordinary size and pitch. Multiply the number of threads to the inch by 2 for the denominator of a fraction for which take 3 for the numerator, subtract this fraction from the diameter of the tap; the remainder is the diameter of drill. Example: Required to find size of a drill for a 1 in. 8 thread tap, 2×8=16. 1 in. = 16-16 and less 3-16 = 13-16. Answer.

(12) P. N., Newburgh, N.Y., writes: 1. In your issue of June 11, 1881, you give a rule for setting compound gears upon a lathe for screw cutting which I am at a loss to understand. I run a lathe having a feed screw of 4 threads to the inch, I wish to cut 18 threads and proceed by your rule. If I understand it right, 18 threads would be 1-18 pitch, and 4 would be ¼ pitch. Then you say "Divide the pitch of thread to be cut by the pitch of feed screw," which would be 1-18÷¼=2-9. I then select the two gears, 28×42, and multiply by 2-9 = 261 3-9, which number is less than the product of the two smaller gears, and consequently cannot be right. It is quite evident that the feed screw would turn faster than the lathe spindle, which is right opposite to what it should be. As I understand it, the lathe spindle must turn 18 times while the feed screw turns 4 times, consequently the lathe spindle will turn 4½ times, while the feed screw turns once? *A.*—The question to be solved is as follows: Let it be required to cut 18 threads to the inch upon a lathe having a feed screw with 4 threads to the inch. We divide the pitch to the inch of the thread to be cut, which is 18, by the pitch to the inch of the feed screw, which is 4, then 18 ÷ 4 = 4.5, the proportional number. We now select for the mandrel a gear having 28 teeth, also one having 42 teeth, for the smallest gear of the compounded pair. These we multiply together, 28×42×4.5=5292. We now select a gear having 63 teeth for the largest wheel of the compounded pair, and divide the last product by that number, thus: 5292÷63=84, which gives the number of teeth in the gear to be placed upon the feed screw. The gears are to be placed as follows: Spindle 28; largest gear of compounded pair, 63; smallest gear of compounded pair, 42; feed screw, 84. You start out with the wrong proportion, which is the cause of your failure in applying the rule given. The rule given should read pitch to the inch. It does not matter whether the large or the small pinion, or the large or the small gear, form the intermediate. If you work by this rule a few times, and place the gears upon a lathe, you will experience little or no difficulty. 2. Does a square double thread of 2 to the inch, change the pitch from ½ to ¼ pitch? If so, how does it? *A.*—The apparent pitch of a double thread is one-half its actual pitch. In other words, to cut a double thread a lathe is geared to cut a single thread of double the apparent pitch. After finishing the single thread the lathe is changed, as described in answer to question 7, in our issue of June 11, 1881, when the second or double thread is cut. The actual pitch of a double threaded screw is the distance from the center of one of the threads to the center of the next of the first or single threads cut.


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## MANUFACTURES.

The Bass Foundry and Machine Works, Fort Wayne, Ind., are building a new two story machine shop 70 x 230 ft. They employ 600 men.

The Georgia Car Company are to build a car factory at Cartersville, Georgia. Preparations are being made to begin the work at once.

The machine shop of Lafferty Brothers, at Gloucester City, N. J., is rapidly approaching completion and will be ready for operation in two or three weeks.

Steps are being taken by Alfred Wilkinson, of Manayunk, and others, to organize a company, in Philadelphia, for the manufacture of metallic packing and other steam engine specialties.

Williams, White & Co., Moline, Ill., manufacturers of dead-stroke power hammers, bending machines, drop presses, &c., are about to build a large addition to their works and put in more machinery.

Flather & Co., Nashua, N. H., have just completed an addition to their shop, and are putting in new tools. They are very busy, but hope with increased facilities to catch up with their orders.

John Douglass, 83 Morgan street, Jersey City, N. J., has taken his son into partnership, and increased his facilities for doing a general business in plain and fine patterns, also models in wood. The business will be hereafter conducted under the firm name of John Douglass & Son.

M. C. Bullock, Chicago, Ill., is about to commence to build Prof. Sweet's Straight Line Engine on royalty. He will have the exclusive manufacture and sale of these engines for the entire Northwest. The drawings for four sizes are now being made at the Straight Line Engine Works in Syracuse, N.Y.

The Forest City Foundry and Machine Works, Geo. R. Lombard & Co., Augusta, Ga., are enlarging their shops by a 50×200 feet addition. The new building will be used for a foundry. They now employ 90 men, but will increase the force to 125 or more. They have just added a boiler shop to their works.

The Corliss Steam Engine Company, Providence, R. I., are building a pair of engines for the Hamilton Manufacturing Co., Lowell, Mass. The cylinders are 30" in diameter and 72" stroke. The fly wheel is 30 ft. in diameter, and has an 88" face, intended for three belts; two of which are to be 34" wide and one 12". The weight of this wheel complete will be 75,000 pounds.

The Defiance Twist Drill Company of Taunton, will shortly begin to produce twist drills which are said to be an improvement on those heretofore made by the old process of milling the grooves, &c. The company will use the best quality of cast steel made expressly for these drills. The process of tempering insures an article, that is said to do a greater amount of work than that accomplished by many of the twist drills now in use.—*Boston Commercial Bulletin.*

William Coutie, of Troy, N. Y., compounded a steam engine twenty years ago under somewhat peculiar circumstances. He was building, at that time, a machine shop for his own occupancy, and conceived the idea of using the exhaust steam from a high pressure engine, situated across the street, to run the engine to furnish his power. This plan he successfully carried out and ever since has got his power in this way. The high-pressure engine belonged to other parties, with whom he contracted for the exhaust for a nominal price, stipulating not to increase the back pressure in their cylinder. The only changes made, in this time, have been the substituting of a larger cylinder and increasing the speed, to meet his demands for more power. Altogether this comes nearer getting something for nothing than most examples of steam engineering.

One of the rising industries would seem to be the manufacture of barrels, pails, packages, &c., from paper stock. Witnessing the operation at the works of the American Paper Barrel Co. at Hartford, Conn., it would seem that notwithstanding the name, these products are not paper at all in the sense as were paper pails heretofore manufactured. In fact their only claim to being called paper would seem to be that they are made of stock from which a very poor quality of paper *might* be made. This stock is pumped from the beating engine into an overhead tank, from which it is in turn drawn into the moulds. The mould, in the case of a barrel, is represented by the space between a sectional interior core, and similar outer sections. The outer sections are arranged to be projected inwardly with great force, and the space between the inner and outer sections being filled with pulp, and the outer sections being thus projected while the inner sections remain immovable, the water is expressed and the contents of the mould solidified. The outer sections are then brought back and out of the way, while the inner sections are literally rolled up through an ingenious mechanical operation, leaving the barrel free to be removed, the operation occupying but a few moments. They are afterwards dried in the dry-room; the heads similarly moulded under pressure are inserted; a small number of iron hoops driven, and the barrel is ready to paint. The painting consists of submitting the barrels to different "processes," suggested by the use which is to be made of them. Thus, in some instances, it is simply a coat of paint, while in others the process contemplates penetrating and filling the pores. The company at Hartford have barrels and kegs filled with kerosene, varnish, molasses, &c., and have experimentally shipped a barrel of molasses and one of kerosene overland to California, the contents, we are told, arriving at their destination in perfect order. The writer saw the head removed and replaced in a small fraction of a minute, and upon the barrel being placed with this head down, no leakage of its contents—which was kerosene—could be detected.

The list of articles which it is claimed can be successfully manufactured in this way, embraces almost every form of package made from wood.

## Machinists' and Engineers' Supplies.

NEW YORK, June 30, 1881.

The supply market is becoming a little more quiet, as some of the mills and factories close at this season of the year for repairs. Prices are steady and the demand is fair. The prices of 35 pound and 40 pound vises have been reduced to $8 and $9, respectively, with no change in the discount list.

James Beggs & Co., 8 Dey street, have taken the sole agency of the Jenks Duplex Injector for New York City and vicinity. The same firm are introducing the Schultz raw hide leather belting. The chief peculiarity of this belting is that the hides are tanned only upon the surface, leaving the full natural strength of the hide within, which is said to greatly increase the durability of belts. This belting is made up into single, one and one-half, and double thickness.

E. P. Bullard, 14 Dey street, New York city, has taken the whole of the first floor and basement at that place, and increased the size of his offices. He is also bringing out a new lathe, which combines great power and strength with the capacity of doing a great variety of work.

The File Manufacturers' Association has adopted a new price list, which may be obtained of any of its members. The discounts remain as before, but the new list on a general assortment shows an advance of about 6 per cent.

## Iron and Metal Review.

NEW YORK, June 30, 1881.

The pig iron trade is depressed. Production seems to have gone ahead of consumption. We quote: No. 1 Foundry, $23.50 to $24; No. 2 Foundry, $21.50 to $22, and Grey Forge, $20. Scotch pig is a little firmer, at $23 to $23 50 for Coltness, $21 for Eglinton, and $22 to $23 Glengarnock, Carnbroe, and Gartscherrie. The rail market is unchanged. No. 1 Wrought Scrap, from yard, is selling at $29 to $30. Manufactured iron from store is steady on a basis of 2.5c. for refined bar. Ingot Copper sells at 16½c.; Straits tin at 20¾c. to 21c.; common Pig Lead at 4⅛c. to 4¼c., and Refined at 4¼c. to 4¾c.; Western Spelter at 4⅞c. to 5c. Sheet Zinc at 6¾c. to 7c., and Antimony at 14c. to 14½c.

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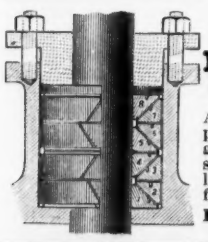

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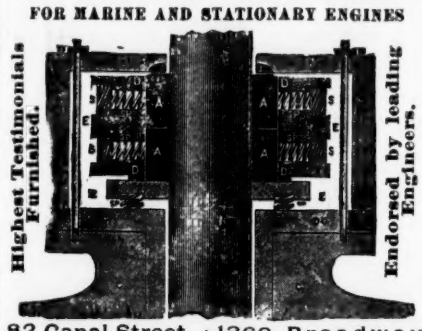

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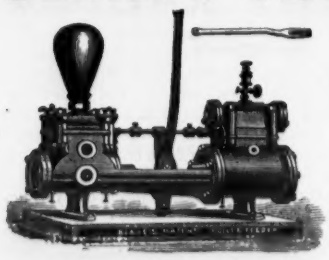

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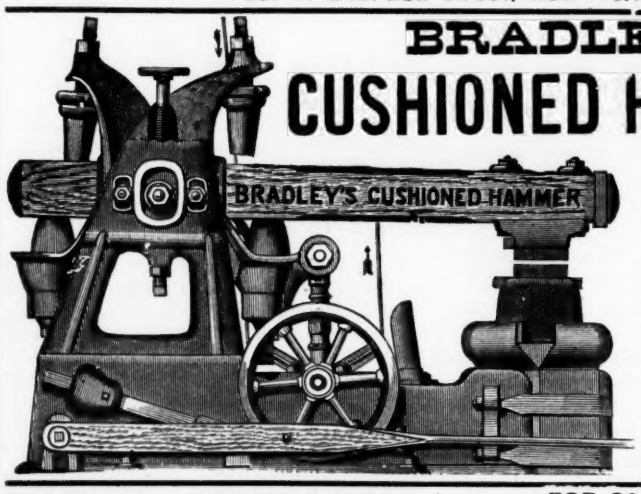
**Standard of Excellence**
At Home and Abroad.
THE A. S. CAMERON STEAM PUMP WORKS,
Foot of East 23d Street, New York.

**BRADLEY'S**
# CUSHIONED HAMMER




STANDS TO-DAY
**WITHOUT AN EQUAL.**
It approaches nearer the action of the smith's arm than any hammer in the world.
**Bradley & Company,**
SYRACUSE, N. Y.
[Established 1832.]

**TOOLS for MECHANICS,**
**ENGINES AND BOILERS,**
**Machinery and Supplies,**
O. L. PACKARD,
Milwaukee, Wis.

**WANTED**
To arrange with the proper party to manufacture
**AN AUTOMATIC STEAM ENGINE**
on royalty, or would dispose of patents on fair terms. Have patterns for six sizes. Engine equal to the best. Address box 15, AMERICAN MACHINIST office, 96 Fulton Street, New York.

**FOR SALE CHEAP.**
Foundry, Machine, Blacksmith, Boiler and Wood Shops, with Engine and Boiler, Line Shafting and Pulleys, Mackenzie Cupola and Blower, Forges, &c.
Address E. M. BIRDSALL, Penn Yan, N. Y.

WILEY & RUSSELL MFG. CO., GREENFIELD, MASS.
Lightning Screw Cutting Machines and Tools.

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**THE BACKUS WATER MOTOR**

Supplies from Hydrant pressure the cheapest power known for blowing Church Organs, running Printing Presses, *Sewing Machines*, Turning Lathes, Saws, Grindstones, Coffee Mills, Sausage Machines, *Electric Lights*, Elevators, etc. Needs little room, no firing up, fuel, ashes, repairs, engineer, explosion, delay, extra insurance or coal bills. Is noiseless, neat, compact, steady; will work at any pressure of water above 15 lbs. Prices from $15 to $300.

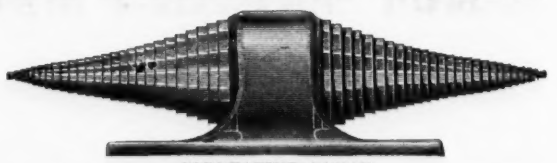
These fans can be fastened to ceiling or side wall, and driven by a round belt direct from a Backus Water Motor, Steam Engine or other power. Blades can be covered with paper muslin to suit the taste in color. By changing angle of Blade amount of air can be regulated. Two or more fans can be connected on ceiling. Shaft of fan runs in metaline journals, and requires no oiling, a consideration where put up in dining rooms over tables. Price, $5 each

**NOISELESS ROTARY FANS**

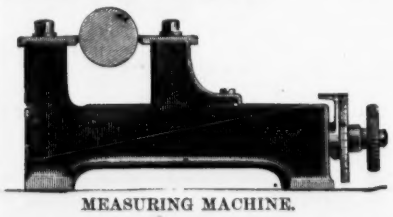
THE BACKUS WATER MOTOR CO., Newark, N. J., or 323 Broadway, New York.

**BETTS MACHINE CO., WILMINGTON, DEL.**
MANUFACTURERS OF
**STANDARD GAUGES,**
**MEASURING MACHINES & ADJUSTABLE REAMERS.**

STANDARD GAUGE.
Any size from ¼ in to 6 in.



CORRECTIVE GAUGE.
The disks are ground separately. Any combination of sizes can be made.



MEASURING MACHINE.
Sizes, 0 to 4 in., 0 to 12 in., 0 to 24 in. Can indicate to $\frac{1}{10000}$ of an inch.

ADJUSTABLE REAMER.
Any size from ½ in. to 2½ in.
Size Maintained by Blade Adjustment.
Will Outlast the Solid Reamer.
Shank Ground to Standard Size.

**KEEP SIZES RIGHT and thus CHEAPEN PRODUCTION.**
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